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FULL-SCALE INCINERATION SYSTEM DEMONSTRATION AT THE NAVAL BATTALION CONSTRUCTION CENTER, GULFPORT, MISSISSIPPI - VOL V: INCINERATOR AVAILABILITY

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This technical report is divided into eight volumes. This portion of the report comprises Volume V, Incinerator Availability. This volume describes the methods used to collect availability data. It presents an evaluation of the data collected, and discusses the items (components) that contributed to the availability of the incinerator. It provides a general background section, a brief description of the process equipment, the planning and implementation used to collect availability data, field operations and field data, an incinerator availability evaluation, and specific incinerator component inspection conclusions and recommendations.

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EXECUTIVE SUMMARY

The Naval Construction Battalion Center Demonstration Project was conducted as part of the research test and evaluation phase of the U.S. Air Force Installation Restoration Program and was sponsored by the Air Force Engineering and Services Center. The overall goal of the project was to determine the cost and effectiveness of a 100 tons/day rotary kiln incinerator in processing soil contaminated with dioxins and other hazardous constituents of Herbicide Orange.

The demonstration program consisted of three phases. The first phase, the verification test burn, demonstrated the effectiveness of the 100 tons/day incinerator to destroy soil contaminated with constituents of Herbicide Orange, in particular 2,3,7,8-tetrachlorinateddibenzodioxin.

The second phase demonstrated the ability of the incinerator to meet the requirements of the Resource Conservation and Recovery Act (RCRA), which specifies that the incinerator must meet or exceed a Destruction and Removal Efficiency of 99.9999%.

The third phase determined the cost and reliability of using the incinerator on a long-term basis while processing more than 26,000 tons of contaminated soil between November 25, 1987, and November 19, 1988.

Maintenance information pertaining to the incineration system was collected daily from the operator's logbook, scheduled and unscheduled maintenance forms, and the Data Acquisition System Interlock Summary Sheet. The maintenance and cost data were entered into a computer data base. These data were used to calculate the availability and cost effectiveness of the incineration system.

This report is the fifth of eight volumes. It includes a general background section, a brief description of the MWP-2000 incinerator system components and operation, the planning and implementation used to collect availability data, field operations and field data, the incinerator availability evaluation, and finally a conclusion and recommendation section.

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PREFACE

This report was prepared by EG&G Idaho, Inc., P. O. Box 1625, Idaho Falls, ID 83415, under Job Order Number (JON) 2103 9027, for the Air Force Engineering and Services Center, Engineering and Services Laboratory, Tyndall Air Force Base, Florida 32403-6001.

This report summarizes work done between September 1989 and February 1989 Major Terry Stoddart and Major Michael L. Shelley were the AFESC/RDVS Project Officers.

This report has been reviewed by the Public Affairs Office (PA) and is releasable to the general public, including foreign nationals.

This report has been reviewed and is approved for publication.

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LIST OF ABBREVIATIONS

AFESC	Air Force Engineering and Services Center
AWFSO	Automatic Waste Feed Shut Off
BTU	British Thermal Unit
DAS	Data Acquisition System
DOD	Department of Defense
DOE	Department of Energy
DRE	Destruction and Removal Efficiency
E&I	Electrical and Instrument
ENT	Effluent Neutralization Tank
EPA	Environmental Protection Agency
HAFR	High Average Feed Rate
HO	Herbicide Orange
HSWA	Hazardous and Solids Waste Amendments
INEL	Idaho National Engineering Laboratory
I.T.	International Technologies Corporation
LKOD	Low Kiln Outlet Draft
LKOT	Low Kiln Outlet Temperature
LRT	Low Retention Time
MTBF	Mean Time Between Failure
MWP	Mobile Waste Processor
NCBC	Naval Construction Battalion Center
OEHL	Occupational and Environmental Health Laboratory
PC	Personal Computer
POTW	Publicly Owned Treatment Works
PPB	Parts Per Billion
PPM	Parts Per Million
RCRA	Resource Conservation and Recovery Act
RD&D	Research, Development, and Demonstration
RPM	Revolutions Per Minute
SCC	Secondary Combustion Chamber
USAF	United States Air Force
WC	Water Column

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SECTION I
INTRODUCTION

A. OBJECTIVE

The purpose of the Naval Construction Battalion Center (NCBC) Demonstration Project was to demonstrate the reliability and cost-effectiveness of a mobile rotary kiln incinerator in the soil treatment and site restoration of a Herbicide Orange (HO) contaminated site. The mobile waste incineration system, Model MWP-2000, manufactured and operated by ENSCO Environmental Services of Little Rock, Arkansas was selected for the NCBC Demonstration Project. The former HO storage site at the NCBC in Gulfport, Mississippi was the selected location for the demonstration.

The specific goal of this technology demonstration was to reduce the total isomers of tetra-, penta-, and hexachlorodibenzo-p-dioxin and respective isomers of polychlorodibenzofuran to less than one part per billion (ppb). The overall soil treatment goal was to reduce the contaminants to criteria approved by Environmental Protection Agency (EPA) Headquarters, which would facilitate the delisting of soil under the auspices of the Resource Conservation and Recovery Act (RCRA) of 1976, as amended by the Hazardous and Solid Waste Amendments (HSWA) of 1984.

The effectiveness of the demonstration was monitored in terms of cost, availability, maintainability, schedule, and the ability to satisfy the current regulations in terms of total site remediation.

B. BACKGROUND

HO is primarily composed of two compounds, 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), and various esters of these two compounds. HO was sprayed as a defoliant in Vietnam during the 1960s. The NCBC served as an interim storage site (6 to 18 months) for drums destined for Southeast Asia until 1970.

In April 1970, the Secretaries of Agriculture, Health, Education, and Welfare, and the Interior jointly announced the suspension of certain uses of 2,4,5-T. This suspension resulted from published studies indicating that 2,4,5-T was a teratogen. Subsequent studies revealed that the teratogenic effects resulted from a toxic contaminant in the 2,4,5-T identified as tetrachlorodibenzodioxin (TCDD). Subsequently, the Department of Defense (DOD) suspended the use of HO, which contained 2,4,5-T. At the time of suspension, the U.S. Air Force (USAF) had an inventory of 1.37 million gallons of HO in South Vietnam and 0.85 million gallons at NCBC. In September 1971, the DOD directed that the HO in South Vietnam be returned to the United States and that the entire 2.22 million gallons be disposed of in an environmentally safe and efficient manner. The 1.37 million gallons were moved to Johnston Island in the central pacific in April 1972. The average concentration of dioxin in the HO was about 2 parts per million (ppm), with the total amount of TCDD in the entire HO stock estimated at 44.1 pounds.

Various disposal techniques for HO were investigated from 1971 to 1974. Of those techniques investigated, only high-temperature incineration was sufficiently developed to warrant further investigation. Therefore, during the summer of 1977, the USAF disposed of 2.22 million gallons of HO by high-temperature incineration at sea. This operation, Project PACER HO, was accomplished under very stringent U.S. EPA ocean dumping permit requirements.

During storage and handling at the storage sites, some of the HO was spilled onto the surrounding soil. The soil was therefore contaminated with dioxin as well as the 2,4-D and 2,4,5-T components. Prior to this project, the dioxin contamination on the site ranged from nondetectable to over 640 ppb; the average concentration was estimated at 20 ppb.

The USAF plan for disposal of the bulk quantities of HO and the EPA permits for the disposal of the herbicide committed the USAF to a follow-up storage site reclamation and environmental monitoring program.

The major objectives of that required program were to:

1. Determine the magnitude of herbicide, TCDD, and tetrachlorodibenzofuran (TCDF) contamination in and around the former HO storage and test sites.

2. Determine the rate of natural degradation for the phenoxy herbicides (2,4-D and 2,4,5-T), their phenolic degradation products, and TCDD and TCDF in soils of the storage and test sites.

3. Monitor for potential movement of residues from the storage and test sites into adjacent water, sediments, and biological organisms.

4. Recommend managerial techniques for minimizing any impact of the herbicides and dioxin residues on the ecology and human populations near the storage and test sites.

Immediately following the at sea incineration in 1977, the USAF Occupational and Environmental Health Laboratory (OEHL), which is responsible for routine environmental monitoring, initiated site monitoring studies of chemical residues in soil, silt, water, and biological organisms associated with the former HO storage sites at NCBC and Johnston Island.

To accomplish the goals of returning the former HO storage site to full and beneficial use, the Air Force used the technical capabilities of the Department of Energy's (DOE) Idaho National Engineering Laboratory (INEL) and, in particular, EG&G Idaho, a DOE contractor.

In 1985, the Air Force and EG&G Idaho coordinated a site characterization study (Reference 1). The Air Force and EG&G Idaho continued the remediation investigation by coordinating two small-scale projects to demonstrate the feasibility of two different technologies for the removal of dioxin from HO contaminated soil. Although those

demonstrations were successful, the technologies were not sufficiently developed to use for full-scale site remediation. When the small-scale projects were completed, the Air Force still had little data to predict the cost and feasibility of remediating large quantities of contaminated soil. The Air Force, in coordination with EG&G Idaho, proceeded to demonstrate a full-scale demonstration project in which cost and reliability data would be collected during site remediation.

Rotary kiln incineration was chosen as the technology most likely to be cost-effective and reliable. Bids were solicited from a variety of incinerator contractors. Bid evaluation resulted in choosing Environmental Services Company, Pyrotech Division, now known as ENSCO, as the incinerator contractor. While ENSCO provided the equipment and operational personnel for the incinerator and soil excavation, EG&G Idaho provided the expertise in overall project management, EPA permitting, and regulatory compliance. Versar, Inc. provided sampling assistance. IT Analytical Services, Twin Cities Testing, and U.S. Testing provided analytical support.

The full-scale Research, Development, and Demonstration (RD&D) project began in September 1986, when the incinerator was assembled onsite. A verification test burn conducted in December 1986, successfully demonstrated that the incinerator produced no hazardous effluents. In May 1987, a Resource Conservation and Recovery Act (RCRA) Trial Burn successfully demonstrated that the incinerator could achieve the required 99.9999% ("six 9s") Destruction and Removal Efficiency (DRE). Operational testing and site remediation began when EPA Region IV issued the final RD&D permit on November 23, 1987. Testing and remediation continued until November 19, 1988 when the last contaminated soil was processed. The incinerator was decontaminated, disassembled, and removed from the site in February 1989.

The former HO storage site is located at the northern end of the NCBC at Gulfport, Mississippi. In the 1940s, the site was designated as a heavy

equipment storage area. To accommodate that function, the soil was tilled and mixed with portland cement. The natural precipitation and subsequent drying left a 6-10-inch hard pan layer of cement-stabilized soil.

The boundaries of the former HO storage site were determined through an extensive investigation, using aerial photographs, personal interviews, and shipping documents. Based upon those data, an extensive sampling and analysis program was developed.

Figure 1 shows the former HO storage area, which was divided into three major sections separated by railroad tracks. Each area was subdivided into 20- by 20-foot plots and sampled for 2,3,7,8-TCDD.

Area A was used for long-term storage of HO from 1970-77. Areas B and C were used in the 1960s for short-term storage of HO awaiting shipment to Southeast Asia. The average length of time that a drum of HO remained at NCBC was approximately 9 months. Contamination of Areas B and C resulted from spillage during handling of the stored HO drums. Because the drums remained in those areas for only a relatively short time, the spread of contamination was less significant than in Area A. The contaminant migration followed a pattern of decreasing concentration toward the drainage ditches, which lie at the center of the areas. This is because the drums were stored on the rows near Holtman and Greenwood Avenues in Area B and near Holtman Avenue in Area C. The natural gradient of the site is from those rows towards the drainage ditches.

The total area actually used for HO storage was approximately 16 acres. Because of the storage pattern, however, all of areas A, B, and C were left unusable; those areas comprise approximately 31 acres.

Because of the cement-stabilized soil, the spilled HO tended to remain close to the surface and did not penetrate deeply into the underlying soil. Additionally, the principal hazard, 2,3,7,8-TCDD, has a very low solubility in water and a very high affinity to soil particles; hence, it did not migrate to deep subsurface layers of soil.

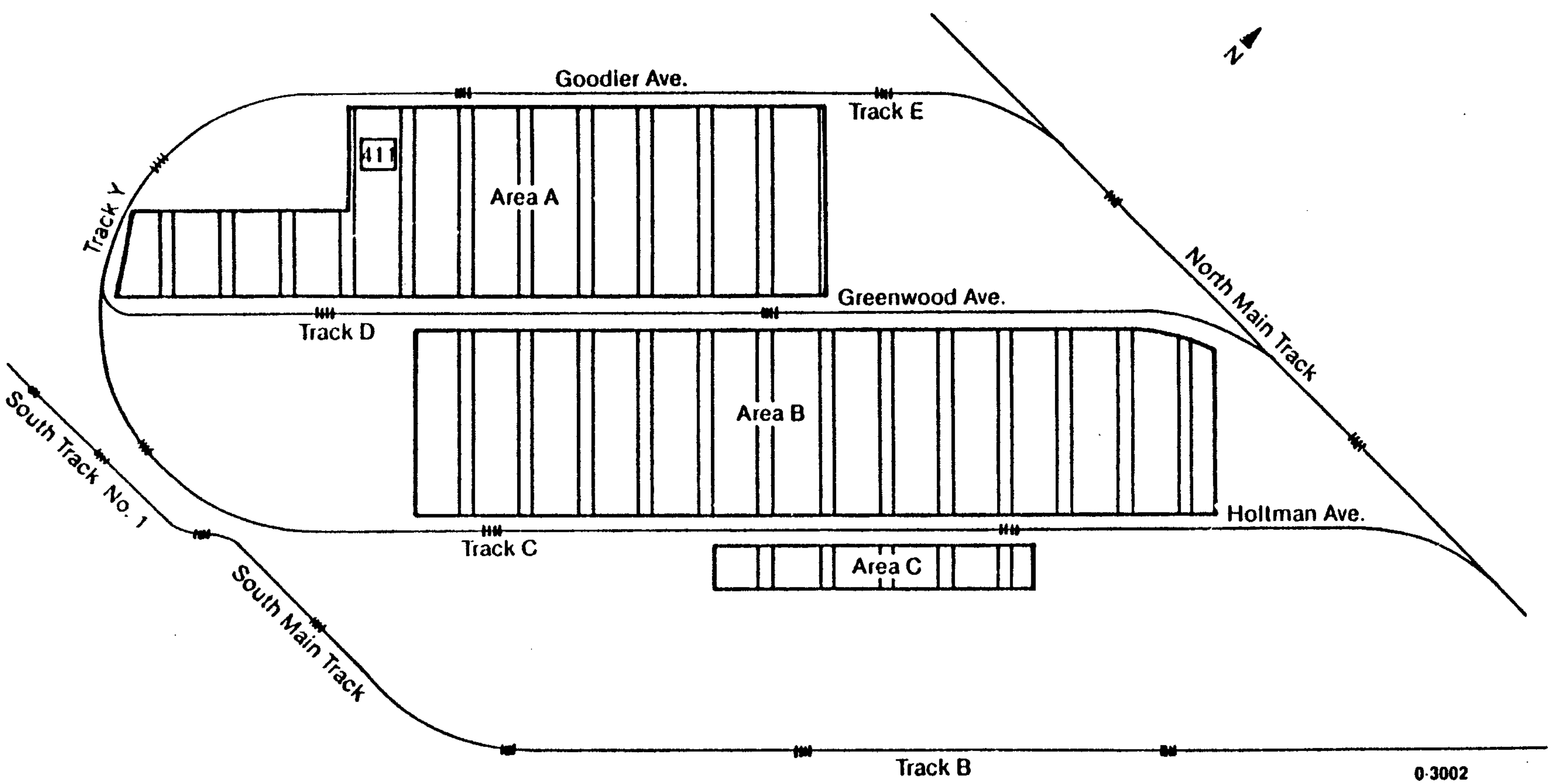

Figure 1. Former HO Storage Site.

1. Site Characterization

In the late 1970s, the Air Force Occupational and Environmental Health Laboratory (OEHL) conducted studies that determined that dioxin was migrating slowly offsite via the drainage ditches. Based upon those studies, the Air Force had sediment filters installed in the drainage ditches to reduce the contaminant migration.

Site characterization of Area A was conducted in two separate campaigns in 1977-78 and in 1980-82. Over 1,700 samples and 200 quality assurance samples were collected to characterize the 16-acre site. These sampling programs consisted of both surface and subsurface sampling. Surface soil samples were obtained at depths up to 5 feet. The sampling program for Areas B and C conducted in 1986-87 consisted of 920 surface samples with an additional 87 samples collected for quality assurance purposes.

C. SCOPE/APPROACH

This report will describe the incinerator process and the collection and formatting of reliability/availability data. This report will also discuss the inspection of selected equipment during decontamination and demobilization and the lessons learned from this project.

SECTION II
TEST EQUIPMENT TECHNOLOGY

This section provides a brief description of the MWP-2000 incinerator system components and operation. A more detailed description can be found in Reference 2.

A. GENERAL DESCRIPTION

The ENSCO incinerator system (Mobile Waste Processor--MWP-2000) was designed and fabricated by ENSCO at the White Bluff, Tennessee, manufacturing facility. The MWP-2000 incinerator is a modular system designed to destroy and detoxify solid, semi-solid, and/or liquid wastes. Most of the components of the system are installed on flatbed trailers, platforms, or skids to facilitate the movement of the system from location to location in order to perform onsite cleanup of contaminated sites.

Figure 2 shows an overall view of the MWP-2000 incinerator system as it was installed at the NCBC site. Figure 3 is a system flow schematic. Principal components of the unit are:

- Waste feed system
- Rotary kiln with outlet cyclones
- Secondary combustion chamber (SCC)
- Air pollution control train consisting of
    - Effluent neutralization unit
    - Packed tower
    - Ejector scrubber, demister, and stack.

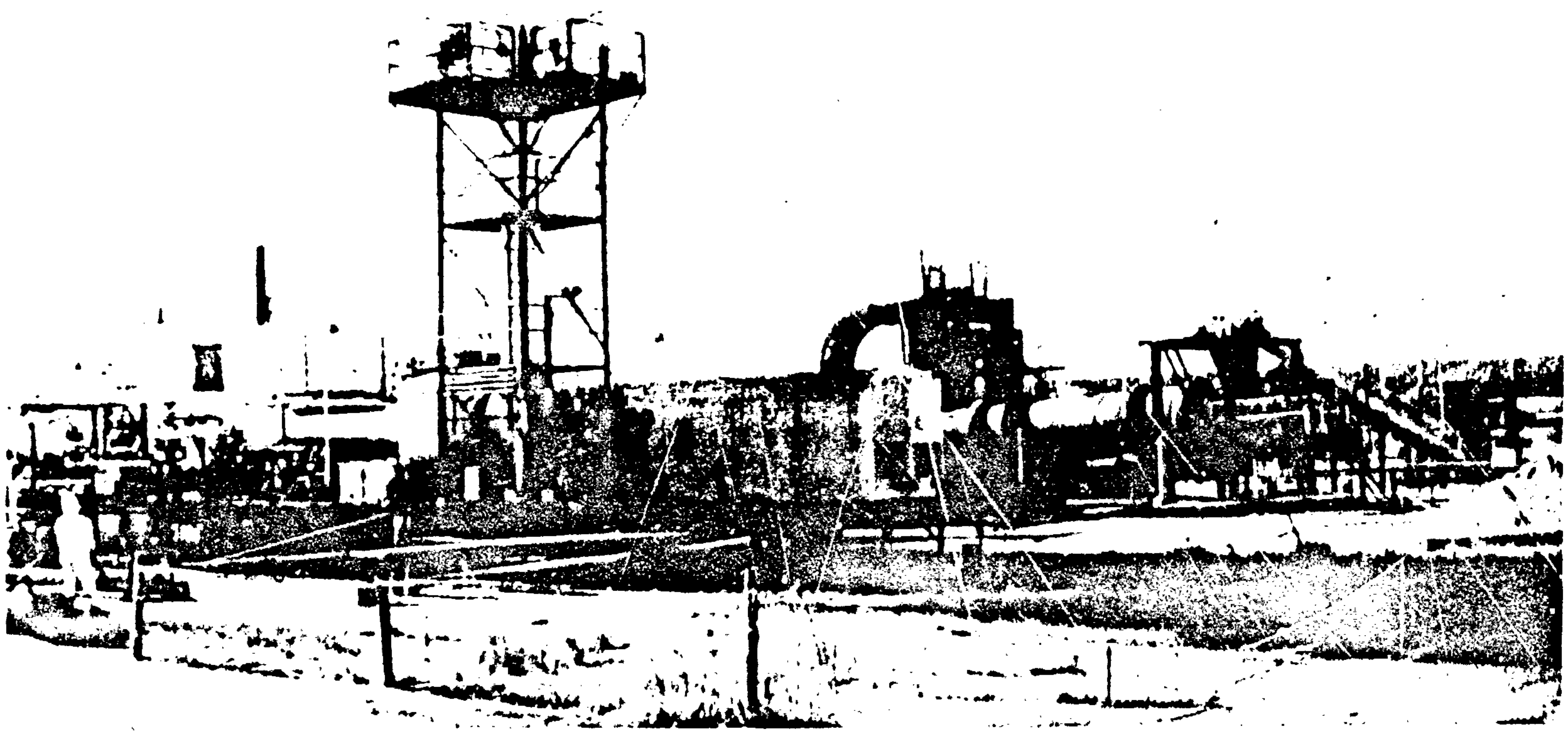

Figure 2. Overall View of MWP-2000 Incinerator System.

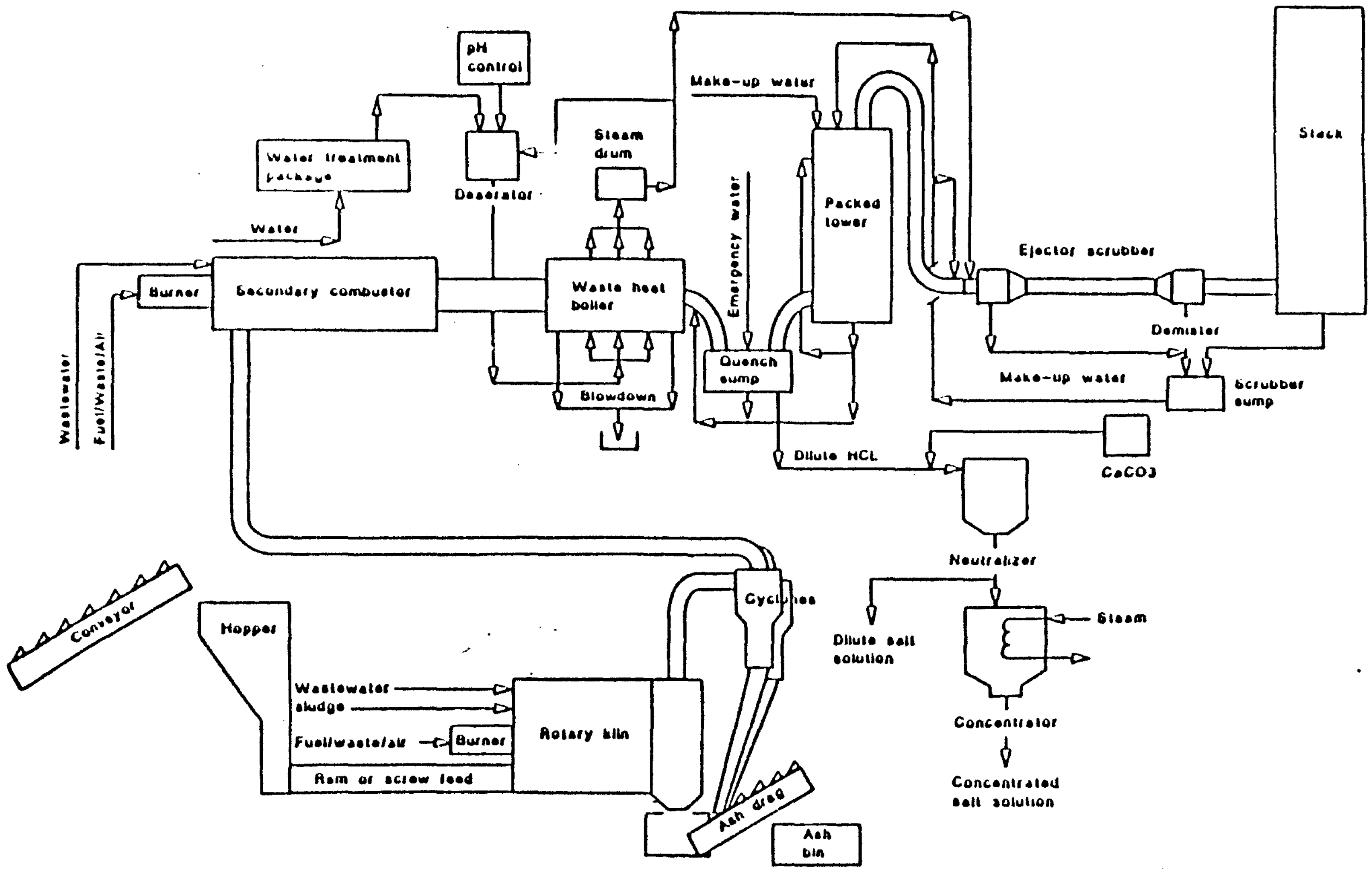

Figure 3. System Flow Schematic.

B. PROCESS DESCRIPTION

1. Contaminated Soil Feed System

Contaminated soil was transferred from the soil storage area to the weigh hopper using a front-end loader. After the weigh hopper was filled, the soil was weighed on digital scales and the weight recorded on a Weigh Hopper Sheet by the operator in the control room. A typical full weigh hopper weighed approximately 10,000 pounds.

After recording the weight of the contaminated soil in the weigh hopper, a slide gate (a steel plate between the weigh hopper and shredder) was opened to allow the soil to drop onto the shredder. As the soil passed through the shredder, it dropped onto a conveyor belt, which carried the material to the feed hopper/feed auger located on the front of the rotary kiln. The feed auger then pushed the material into the kiln for processing. The feed hopper/feed auger is shown in Figure 4.

2. Rotary Kiln

The rotary kiln is a carbon steel cylinder, lined with 6 inches of fire brick mounted horizontally on a custom semi-trailer. The rotary kiln is shown in Figure 5. The kiln has an interior diameter of 5.5 feet and an interior length of 30.0 feet. The kiln is mounted so that it is declined (front to back) 4 degrees; it is capable of being rotated from 0.5 to 4.0 revolutions per minute (rpm). The rotational speed of the kiln for this project was normally 1.5-2 rpm. The soil entered the kiln at the flame end (front) of the kiln and was subjected to temperatures of approximately 2,200°F at the burner and to a minimum temperature of 1,450°F at the outlet end of the kiln.

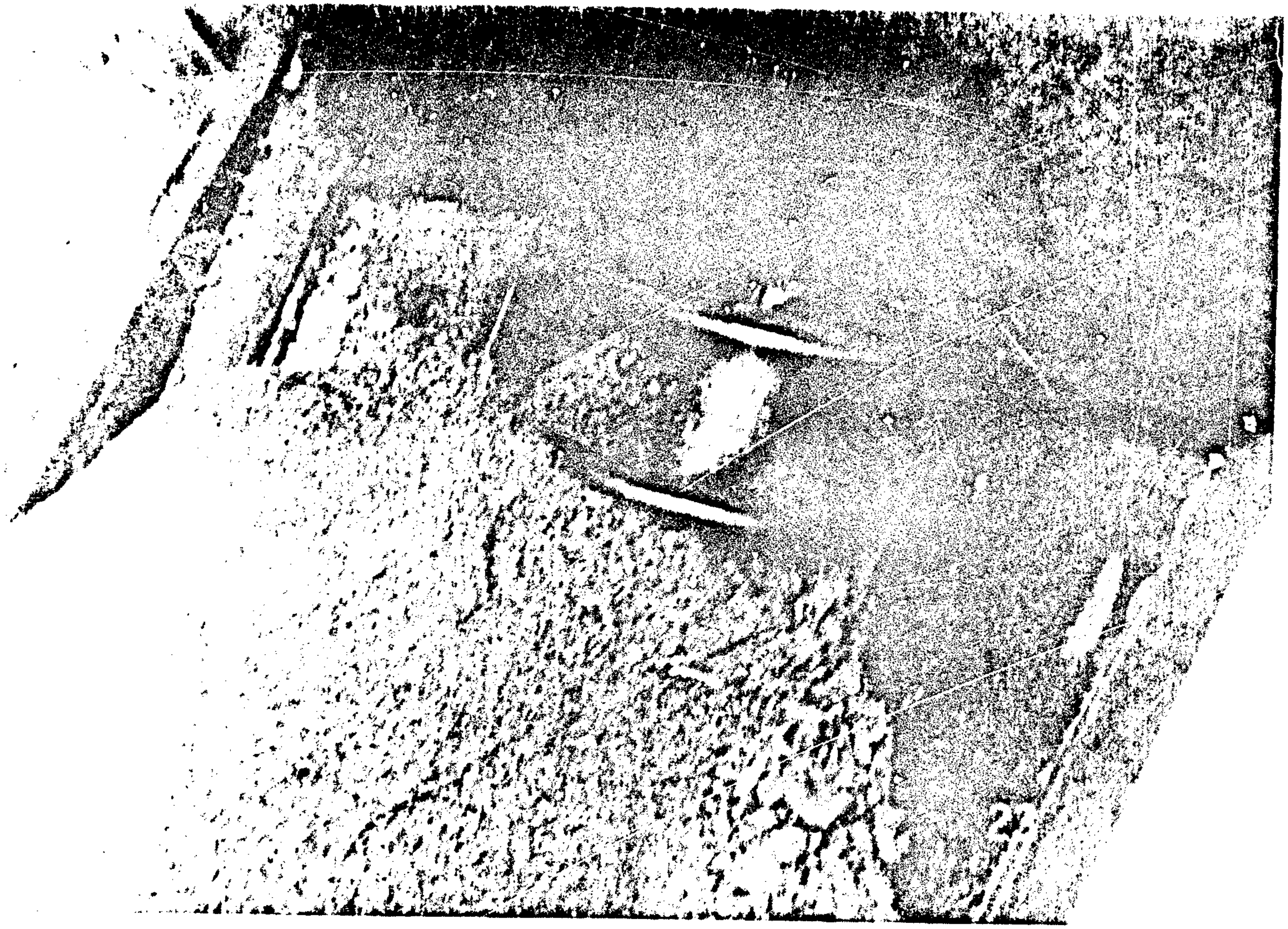

Figure 4. View of Rotary Auger Inside the Feed Hopper.

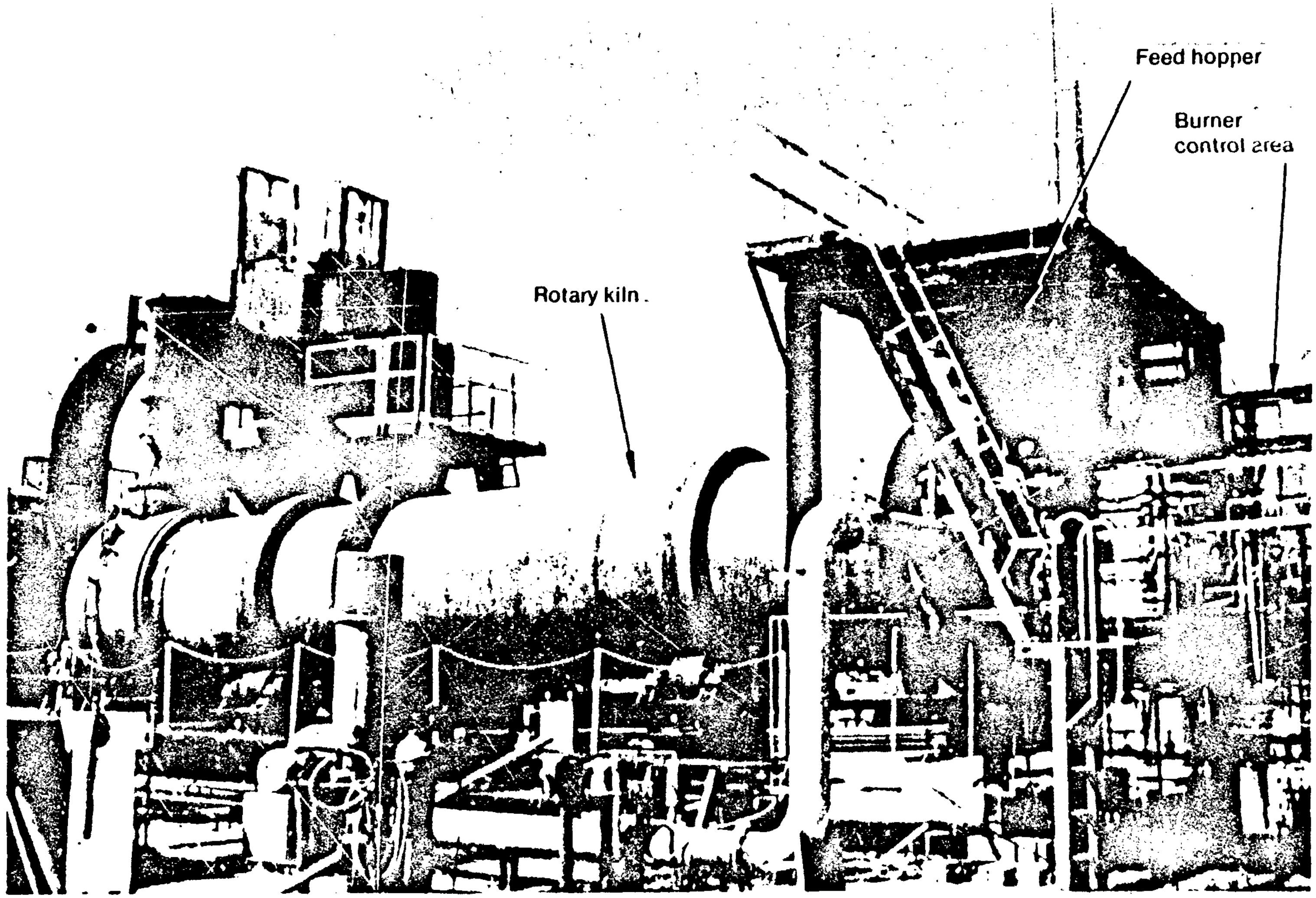

Figure 5. View of Trailer-Mounted Rotary Kiln.

Because of the declination and rotation of the kiln and the continuous feed of soil, processed soil (ash) was pushed to the lower end (rear) of the kiln in approximately 20 minutes where it would fall through the kiln drop chute into the ash removal system. The kiln outlet gases and lighter particulate would exit the kiln at a minimum temperature of 1,450°F, passing through a cyclone on their way to the secondary combustion chamber (SCC). The cyclone's purpose was to remove the lighter particulates from the kiln outlet gases before they reached the SCC. The particulates removed in the cyclone would fall into the ash removal system, which consisted of a receiving tank filled with water, a conveyor (ash drag), and the ash pan. As the hot ash from the kiln and particulates from the cyclone fell into the receiving tank, the water quenched the ash temperature to approximately 200°F. The ash conveyor system dragged the ash from the receiving tank into the ash pan. The ash was removed from the ash pan and transferred to a rolloff box in the ash storage area. The ash quench and cyclone systems are shown in Figure 6.

3. Secondary Combustion Chamber

The SCC is a carbon steel cylinder mounted horizontally on a custom semi-trailer. It is lined with 2.25 inches of insulating brick and 4.50 inches of fire brick. It has an interior diameter of 6.6 feet and an interior length of 40.0 feet. It is designed to further burn the gases discharged from the rotary kiln. The gases were delivered to the SCC through a rectangular carbon steel duct at the burner end of the SCC. The gases were subjected to temperatures ranging from approximately 3,000°F at the burner to a minimum 2,150°F at the outlet end of the SCC. Some of the lighter particulates carried over from the rotary kiln were also deposited in the SCC. This buildup of particulates in the SCC was a major contributor to the unit shutting down for 3 to 4 days after every 50 to 60 days of operating time. The SCC is shown in Figure 7.

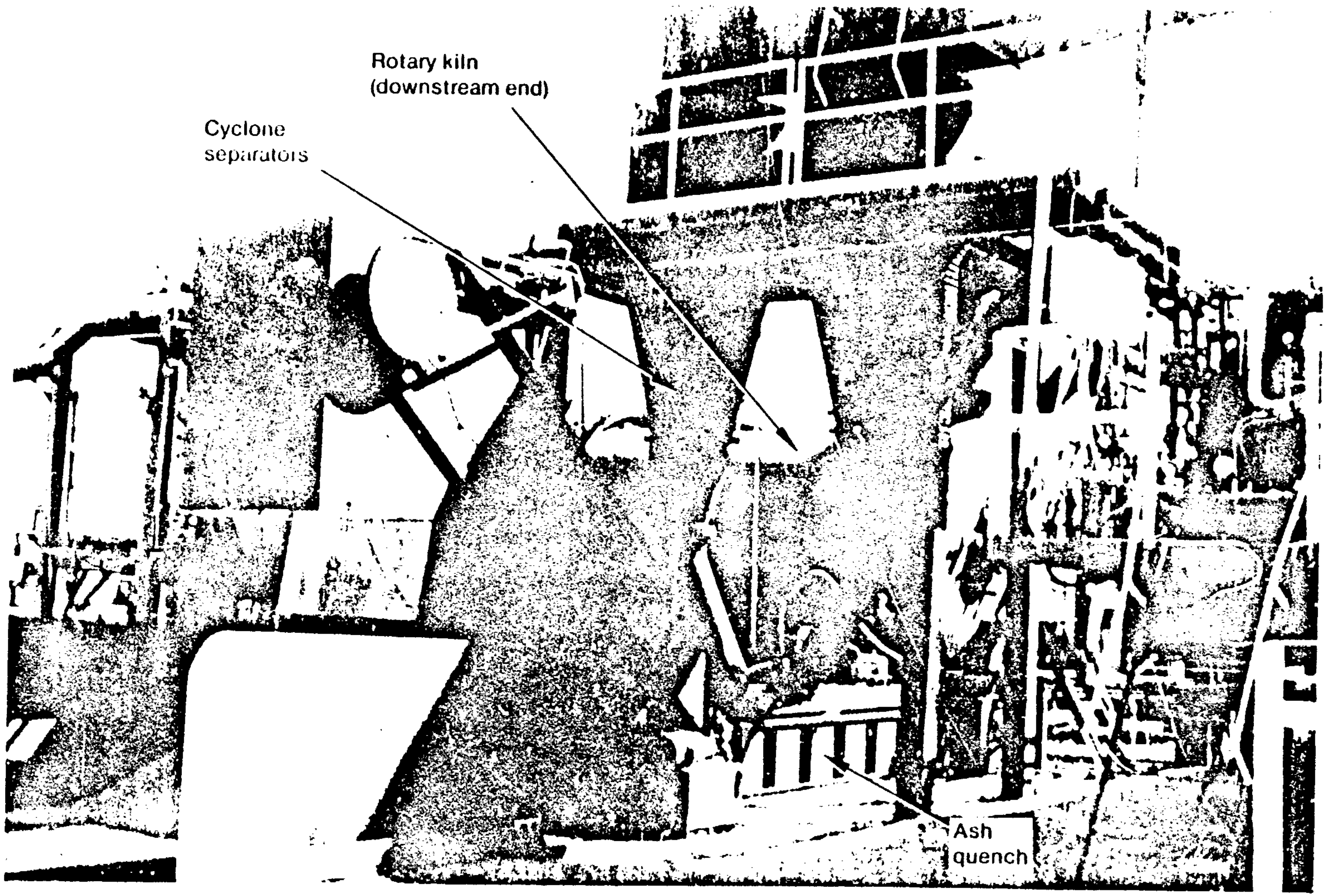

Figure 6. View of Cyclones and Ash Quench.

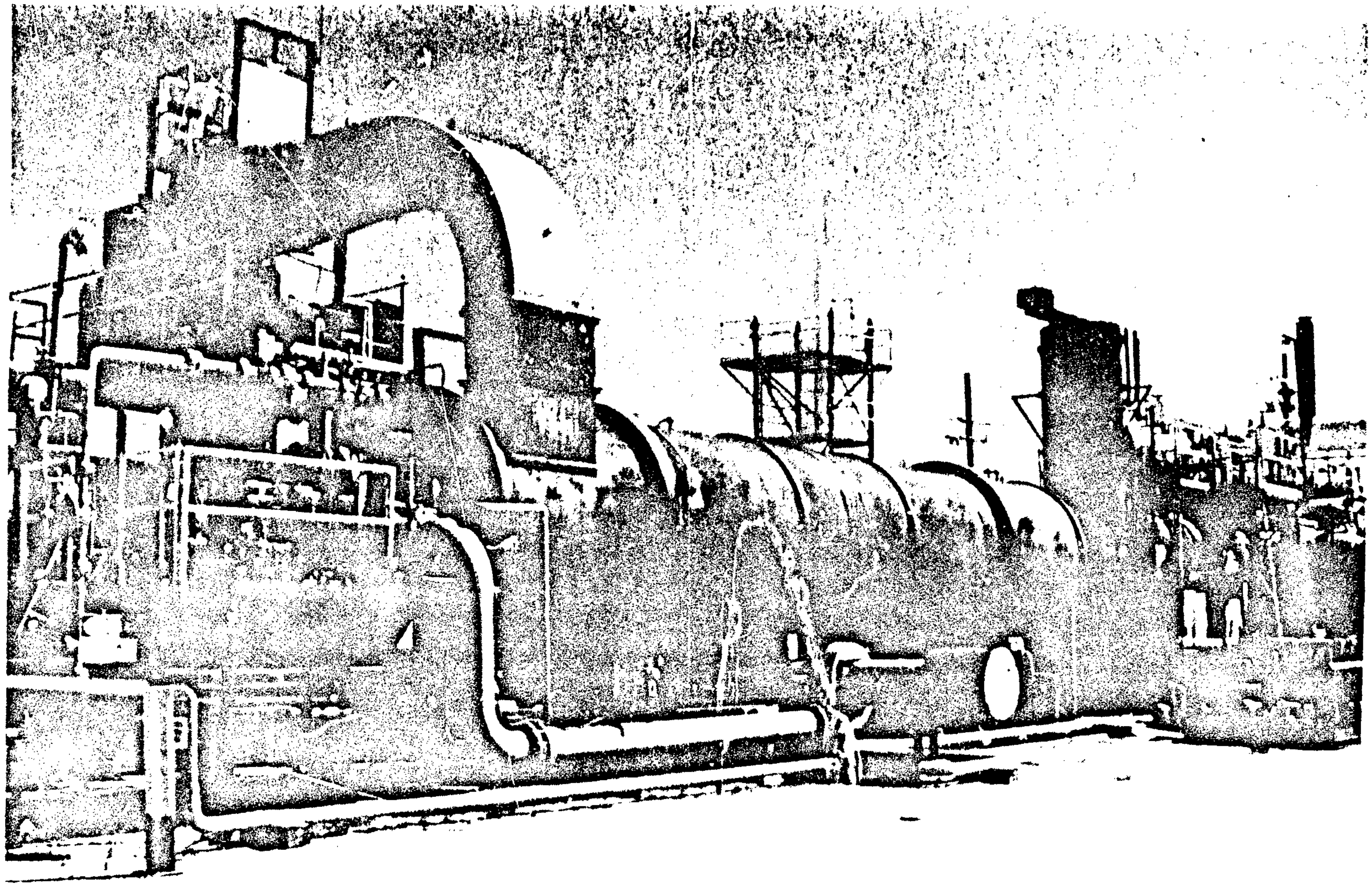

Figure 7. View of Trailer-Mounted Secondary Combustion Chamber.

4. Waste Heat Boiler

The gases exited the SCC and were carried to the waste heat boiler through a carbon steel, T-section duct. The vertical outlet of this T-section duct was equipped with an access lid, which could be opened to vent hot gases away from the boiler and the downstream air pollution control train. As the gases exited the SCC, they passed through a water spray to reduce the gas temperature from approximately 2,150°F to 1,400-1,600°F before they entered the waste heat boiler. The purpose of the water spray was to cool the particulate entrained in the gases to minimize their condensation on the boiler face and in the boiler tubes.

The waste heat boiler is a fire tube boiler. It was designed to recover heat from the process gases and produce steam at 250 psig, which was supplied to the ejector scrubber and deaerator. The waste heat boiler is shown in Figure 8.

5. Air Pollution Control Train

The air pollution control train consisted of a quench system, packed tower, ejector scrubber, stack, and effluent neutralization tank (ENT). This equipment train was designed to cool and remove acid and submicron particulate from the gases that exited the waste heat boiler and to neutralize the effluent generated in this train. The quench elbow and the ENT are shown in Figure 9.

The gases exited the waste heat boiler at a temperature of approximately 400°F where they immediately passed through the quench system (water spray) to further reduce the gas temperature to approximately 165°F before the gases entered the packed tower. The gases flowed upward through the tower and were scrubbed by a countercurrent flow of water sprayed into the top of the tower. The packed tower is shown in Figure 10.

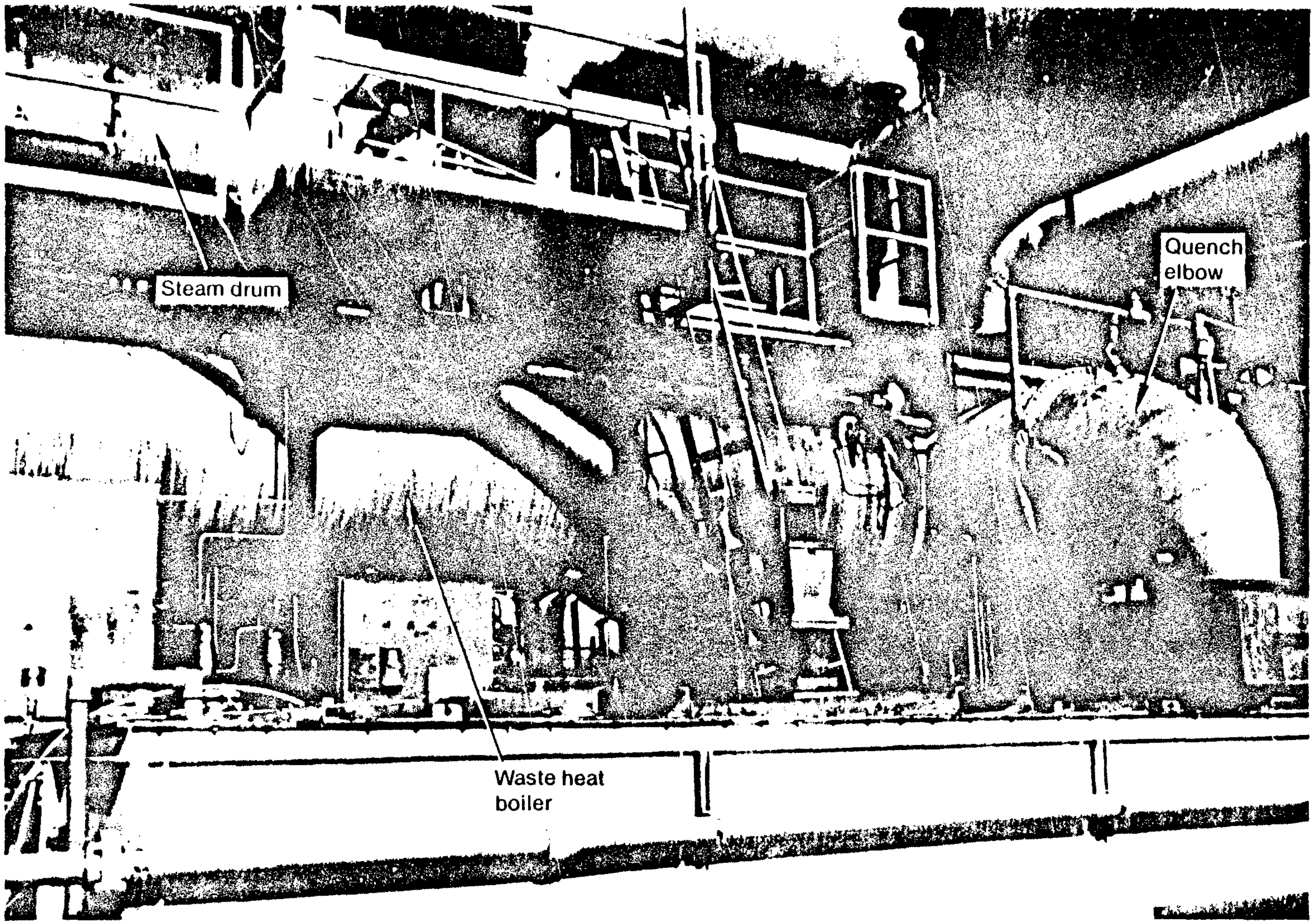

Figure 8. View of Waste Heat Boiler and Steam Drum.

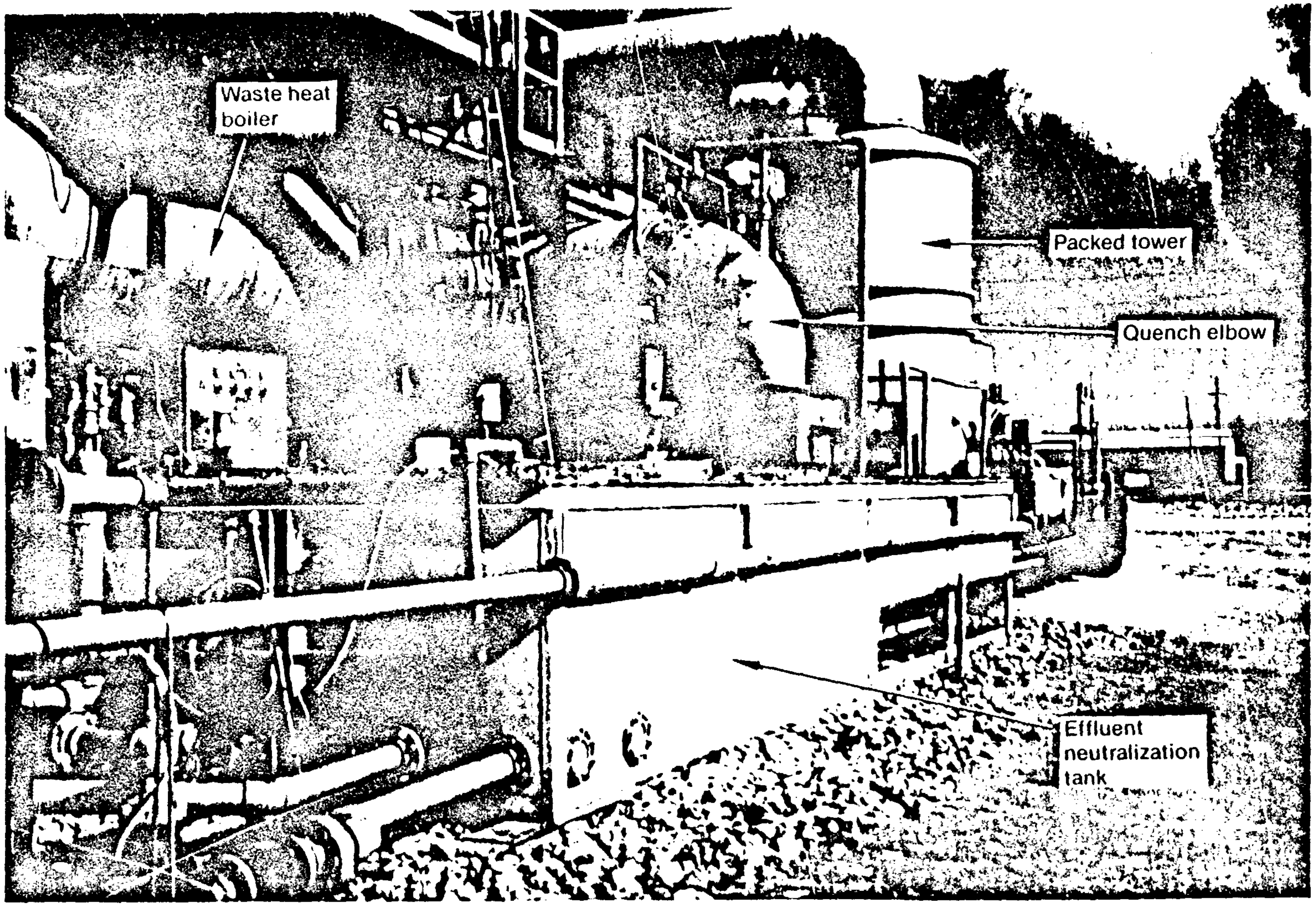

Figure 9. View of Effluent Neutralization Tank with Quench Elbow and Packed Tower.

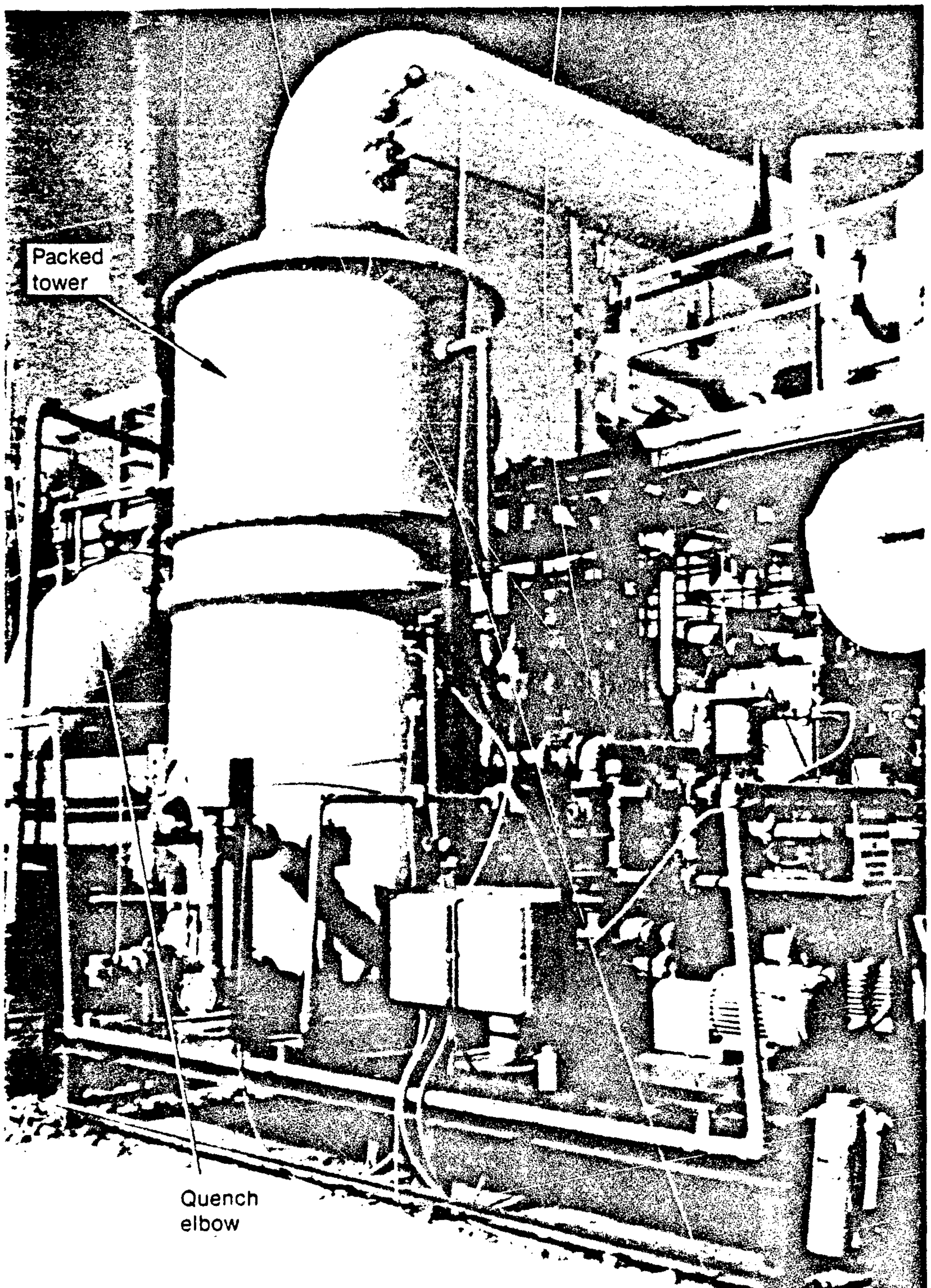

Figure 10. View of Skid Mounted Packed Tower.

The packed tower was designed to remove acid from the gases, but for this project it mainly removed submicron particulate from the gases. From the packed tower the gases flowed through the ejector scrubber to further remove submicron particulate and acid. The gases exiting the packed tower were drawn through the ejector mixing tube by the force of steam delivered through a nozzle in the mixing tube. The turbulence created by the unique nozzle and mixing tube design caused the agglomeration of submicron particulates in the water mist supplied by the steam. This particulate was removed by the removal of water mist in the demister at the downstream end of the scrubber.

The ejector scrubber, also served as the prime mover for the entire system. The drawing of gases through the ejector mixing tube produces up to 25 inches water column (WC) vacuum. This was sufficient vacuum to draw gases through the kiln, SCC, waste heat boiler, and the air pollution control train. The gases exited the ejector scrubber through the demister and out the stack. The ejector scrubber and demister are shown in Figure 11. Because of the steam used in the ejector system, the gases were reheated slightly from the packed tower temperatures and actually exited the stack at approximately 185°F. The stack is shown in Figure 12.

The stack was equipped with a gas sampling system that collected, conditioned, and delivered a continuous stack sample stream to oxygen, carbon monoxide, and carbon dioxide analyzers. These analyzers continuously analyzed the sample stream and transmitted results to the data acquisition and control computer. Strip chart recorders provided redundant recordings of these parameters.

C. GENERAL DESCRIPTION OF MANUAL DATA COLLECTION

1. System Component Codes

Tracking incinerator availability was performed by assigning a sequential code number, (e.g., weigh hopper (01), weigh scales (0101),

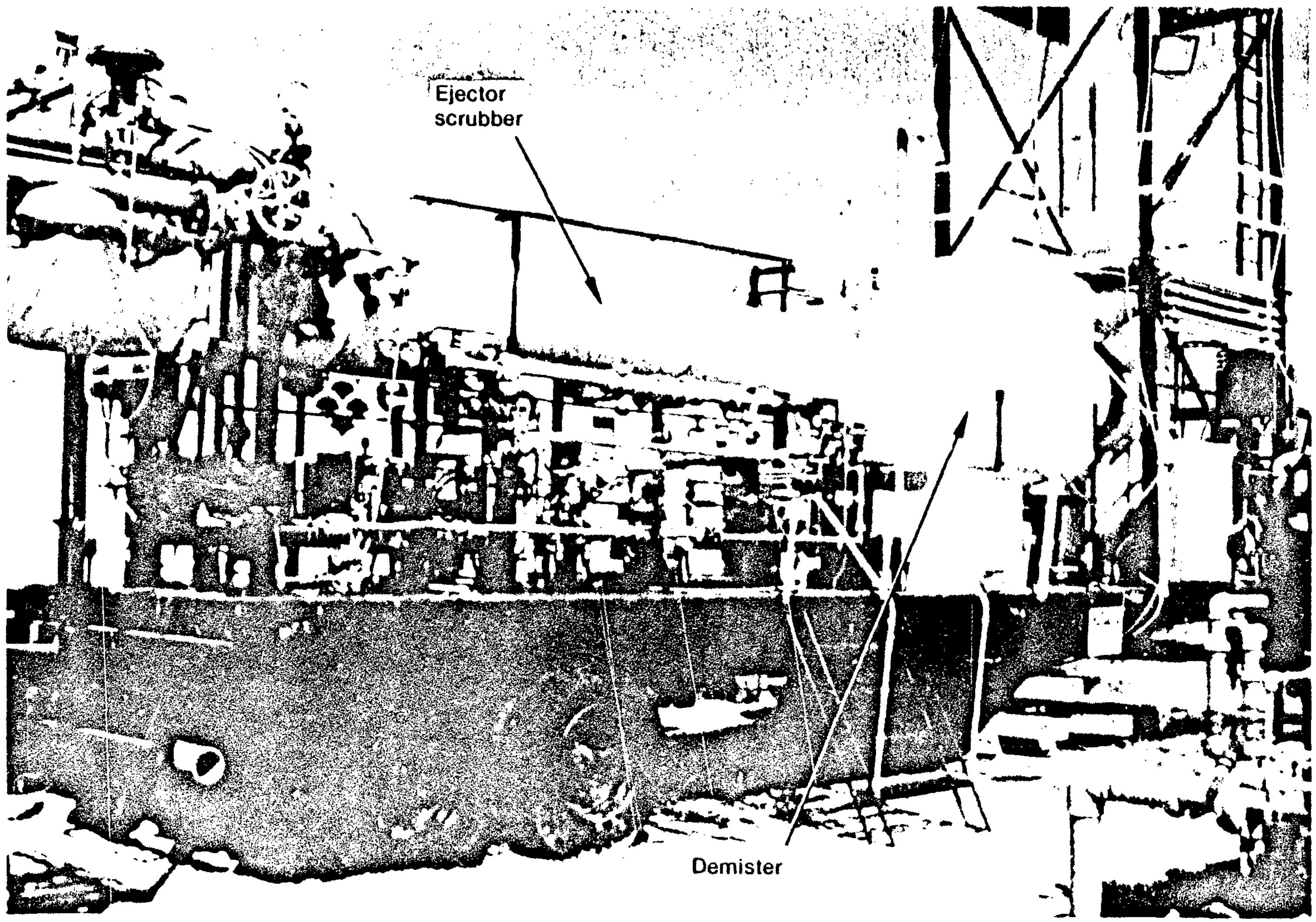

Figure 11. View of Trailer-Mounted Ejector Scrubber and Demister.

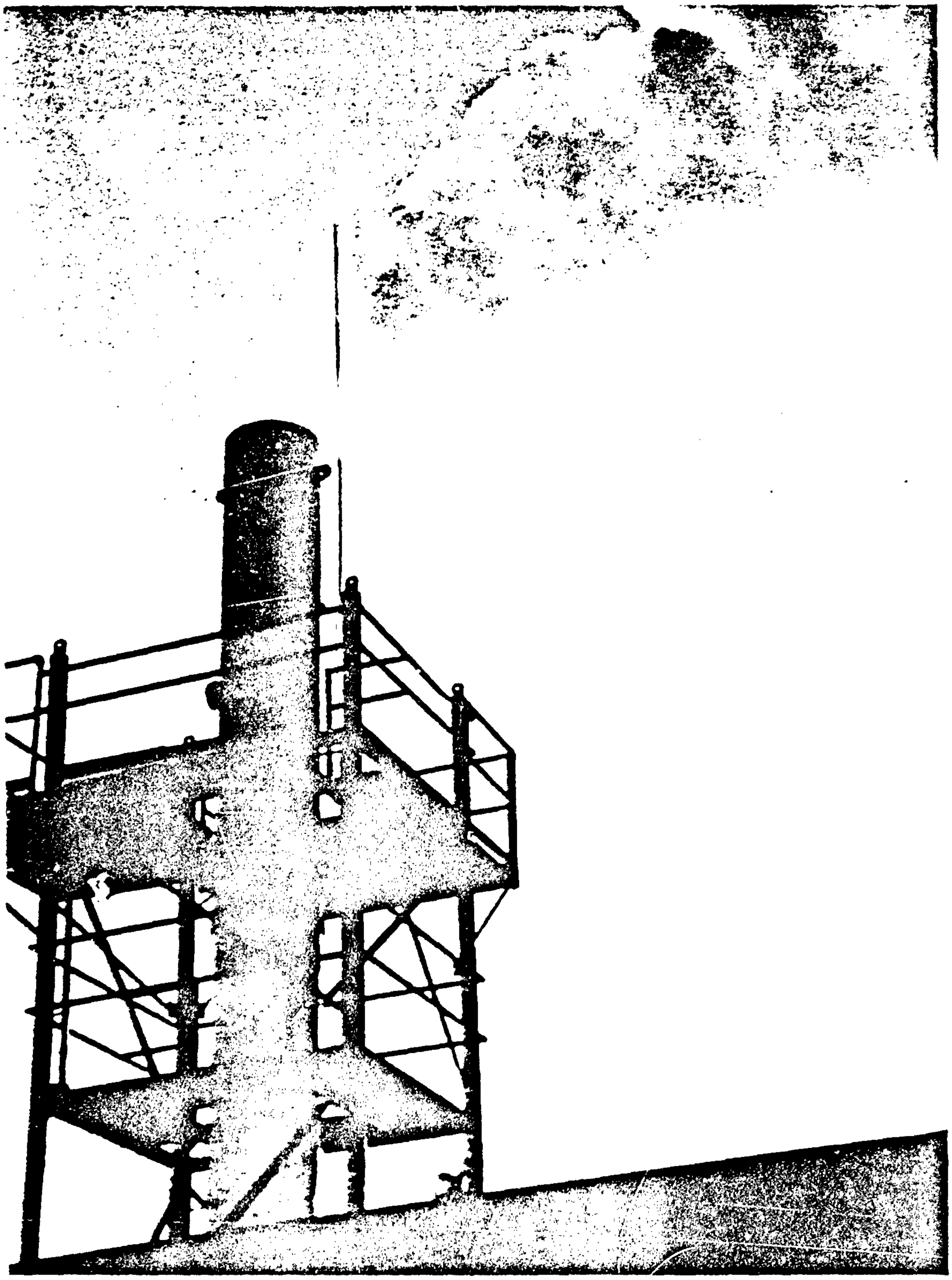

Figure 12. View of Incinerator Stack.

mechanical scales (010101), and shredder (02), for each major component and subcomponent of the MWP-2000 incinerator.

As maintenance was performed on a component or subcomponent, the shift supervisor or Electrical and Instrument (E&I) technicians completed the respective Scheduled or Unscheduled Maintenance Form, listing the component code in the appropriate space (see Appendices A and B for examples of the maintenance forms).

2. Data Base

The information obtained from the Scheduled/Unscheduled Maintenance Forms and the Operator's Log entries was collected daily and stored on a computer data base. This information included the date, type (scheduled/unscheduled) maintenance, component code, amount of time (in minutes) required for the maintenance, cost of parts (if applicable), and a brief description of the work performed. These details were also used by the ENSCO site superintendent in his monthly reports.

3. Criteria for Data Collection

Initially, the criteria for data collection was to collect only data for the maintenance items that resulted in lost production time. This was expanded to include all scheduled and unscheduled maintenance and all auger downtime, such as stopping feed to remove metal scrap from the shredder teeth. Additionally, in a joint decision between the Air Force and EG&G Idaho, a $100 parts cost and 2-hour external (non-ENSCO) labor charge were to be the minimum factors used in collecting the cost data for maintenance. An attempt was made to adhere to these minimum standards, but it was not strictly enforced.

4. Techniques of Determining Availability

To determine the availability of the incinerator to process soil on a daily basis, maintenance information from the scheduled/unscheduled maintenance forms and operator's logbook were added to the auger off-time attributed to process interlocks. Interlocks occurring at the same time as scheduled/unscheduled maintenance or multiple interlocks were discounted to avoid downtime duplications.

D. ON-LINE MONITORING

1. Auger Hours

The EPA permit was based not only on cubic yards of soil to be processed, but also on the number of auger days to process the soil. Based on computer information, the actual number of processing hours each day was calculated using data from the Data Acquisition System (DAS). The number of daily processing hours divided by 24 (hours in a day) times 100 gives the on-line percentage for each day. The on-line percentage used as a decimal is the actual part of a day the incinerator operated. These parts of days were totaled daily giving a running total of the actual auger days used in soil processing. The Daily Report, issued by the ENSCO site superintendent, contained the previous 24 hour shift auger hours, percentage of on-line time for the shift, and the running total of auger days from start of soil processing November 25, 1987.

2. Interlock Record

Part of the DAS information generated each day, were printouts of the Automatic Waste Feed Shutoff (AWFSO) interlocks. When the unit reached a permit limit (high or low), the computer would automatically shut off the feed auger. These were called process interlocks. The feed auger would not start again until the interlock (trip values) were cleared.

SECTION III
PLANNING AND IMPLEMENTATION

A. REPORTING CRITERIA

The main criteria in collecting maintenance data were whether the repair resulted in auger off-time. The auger off-time was the direct link to incinerator availability. The longer or more often the auger was off, not feeding soil to the kiln, the less time the incinerator was available for processing soil. These auger off criteria were used regardless of the time duration.

B. INVOICES

In order to obtain cost data directly associated with an individual repair or replacement, the purchase invoices were regularly monitored. The vendor name, purchase date, end use, and cost were noted for subsequent use in the data base report.

C. INTERLOCKS

The daily interlock summary sheets were reviewed to determine the primary interlocks, to delete duplicate times when multiple interlocks occurred, and to justify interlocks against the logbook entries as well as scheduled/unscheduled maintenance forms. If the feed auger was off for maintenance of any type, those AWFSO interlocks occurring during that particular time frame were discounted.

D. LOG ENTRIES

Two logbooks were maintained on a daily basis: one by the operators in the control room and one by the shift supervisors. The entries to the operator's logbook were made at the time of an occurrence, whereas the supervisor's logbook was more general with numbered entries, not necessarily in chronological order. Copies of the operator's logbook sheets were

reviewed daily to aid in the gathering of maintenance information. Often times, especially in the early stages of the project, the scheduled/unscheduled maintenance forms were not used on a consistent basis.

E. SPARE PARTS INVENTORY

A spare parts inventory was not taken when the incinerator first arrived at the site. When the materials started to run out during the incinerator set-up, an after-the-fact inventory was taken to determine what would be necessary to purchase to complete the assembly. After that time, only replacement parts were purchased. A complete inventory was taken at the end of the project in an attempt to separate the ENSCO-owned property from the government-owned property.

F. INSPECTION PLAN FOR DECONTAMINATION AND DEMOBILIZATION

When the project was still considered to be of 150-day duration, an inspection plan was made. The inspection list included such items as kiln refractory, particulate build-up on boiler tubes, feed auger, and particulate build-up on the packed tower tellerettes. Because the project lasted for 12 months (soil processing), many of those items on the original inspection list were repaired, replaced or cleaned several times.

During the decontamination and demobilization of the unit, those items that showed unusual wear were noted. All phases of the unit/equipment decontamination and disassembly were documented with photographs.

G. METHODS USED TO COLLECT DATA

Maintenance data for this report were collected on a daily basis from scheduled maintenance forms, unscheduled maintenance forms, and the logbooks. Copies of these were kept not only as part of the daily files submitted to EG&G Idaho by ENSCO, but also in separate binders by EG&G Idaho personnel for the availability report. More often than not, the operator's

log entries proved to be more informative than the scheduled/unscheduled maintenance forms. To ensure that all the maintenance data were collected and entered into the data base, all incinerator component downtime was used whether it caused feed auger downtime or not. However, only feed auger downtime was used as the measure of incinerator availability. In those instances where time durations were not noted on the scheduled/unscheduled maintenance forms or operator's log, an average duration for the previous type of work was used.

Cost data for maintenance parts and labor were not collected on a routine basis. There was a time delay between the purchase of a part and the invoice submittal. The invoices were reviewed individually to collect cost data that were applicable.

SECTION IV
FIELD OPERATIONS AND FIELD DATA

A. DAILY REPORTS

The daily reports consisted of: (1) daily logbook entries, (2) inspection checklists (both operational and instrumental), (3) operator's hourly log, (4) soil weight records, (5) soil moisture analysis records, (6) daily stack gas monitor calibration records, (7) daily health and safety records, (8) strip chart records, and (9) the daily computer output that included a floppy disk, interlock summaries, and a 15-minute interval printout of the incinerator operations. This total package was collected each morning by the on-duty shift supervisor and taken to the ENSCO secretary. The secretary made copies of everything for ENSCO files and checked to be sure all the daily paperwork was there. Either the plant superintendent or a shift supervisor would prepare the Daily Report from information on the computer printouts. Once this was accomplished, ENSCO would transfer the originals of the daily records to EG&G Idaho personnel who would then review the package for completeness and any abnormalities of the previous day's operations.

B. PRODUCTIVITY IMPROVEMENTS AND PROCESS CHANGES

As the initial planning for the project and the project itself progressed, numerous changes were made that resulted in more efficient and cost-effective operations.

Some of the more significant changes were:

1. Installed continuous reading ultraviolet flame monitors on both the kiln and secondary burners

2. Installed redundant stack analyzers to operate while the on-line analyzers were being calibrated

3. Changed from originally proposed diesel fuel to natural gas to fuel the kiln and secondary burners

4. Revised the ambient air sampling program to eliminate one of the sample stations and to sample only during the hours of excavation

5. Replaced the original, hollow, welded trunnion rollers on the kiln with solid trunnion rollers

6. Slowed the rotational speed of the kiln and lowered the draft across the incinerator system to minimize particulate carryover into the secondary combustion chamber.

C. DATA COLLECTION DURING DECONTAMINATION AND DEMOBILIZATION

Routine daily operational information was collected during the decontamination of the equipment until the burners in both the kiln and SCC were shut off in mid January, 1989. This information consisted of gas usage and some interlocks during the burning of the decontamination water. However, the information collected after November 19, 1988, was not used in the data analysis for the incinerator availability. November 19, 1988, was used as the end date for pertinent incinerator availablity data as that was the final day of soil processing.

As each piece of equipment was decontaminated, it was swipe tested. The swipes were analyzed for 2,3,7,8-TCDD. A data sheet was developed that described the following: (1) the equipment to be swiped tested, (2) the areas on the equipment to be swiped, and (3) the size of the surface area to be swiped. After assigning a unique number to each sample, the swipe samples were sent to the laboratory for analysis. Upon receipt of the analytical results, the results were entered on the data sheet which was filed in the applicable daily file.

Only data pertaining to possible maintenance was noted during the dismantling of the incinerator.

SECTION V

INCINERATOR AVAILABILITY EVALUATION

A. DATA EVALUATION

Data provided for the availability evaluation of the incinerator consisted of two personal computer (PC) data base files and daily and weekly operator logs. The PC data base files consisted of: (1) a daily log of scheduled and unscheduled maintenance events that involved system component downtime and (2) a daily log of system downtime attributed to instrumentation interlocks (system shutdowns that resulted when system monitoring instrumentation set points were reached). The operator log data included system on-line time, amount of soil processed, and notes concerning system problems and repairs.

The availability evaluation was focused on the incineration of contaminated soils. Data associated with the initial system shakedown and testing period and the period at the end of the program when program-generated waste was burned were excluded. Only those data associated with the period from November 25, 1987 through November 19, 1988 were retained. During this period, a total of 26,058.4 tons of soil were processed.

The data base for maintenance activities required modification to facilitate data searches and sorts. The remarks field was deleted because the data could not be easily electronically searched. Deletion of the remarks field made the data base more manageable and efficient. Valuable information from the remarks field was retained in three new fields: (1) major component - to identify those major components that were most prone to failure, (2) failure mode - to categorize the failure events, and (3) auger status - to identify the probable state of system operation (i.e., whether it was or was not processing soil). The only modification made to the system interlock data base was the deletion of data outside the November 25, 1987 through November 19, 1988 time frame. The data bases, as modified, are included as Appendix C (maintenance data) and Appendix D

(interlock data). Codes used in the data bases are defined on the first page of each listing.

The maintenance data base, as modified, contained 1,223 records. These records are comprised of 358 scheduled maintenance events that account for 166 downtimes (1,521.6 hours of component or system downtime), and 865 unscheduled maintenance events (899.1 hours of component or system downtime); a combined total of 2,421.7 hours or 100.9 days. Not all events resulted in actual system shutdown. For example, although it may have been required to shutdown the system auger for a given event, it did not necessarily result in a system shutdown. If the incinerator had nearly a full charge of feed material at the time of the event, and feeding of material could again be started within approximately 20 minutes of the event, the system could continue soil processing. Thus, for this evaluation, if a record did not explicitly indicate whether or not the feed auger was on (operating), it was assumed to be on during those maintenance activities that involved 20 minutes or less time.

The interlock data base, as modified, contained 1,081 records. These records show that over the approximate 12-month period, a total of 14,461 interlock events were reported. System downtime associated with these events amounted to 393.37 hours.

B. EVALUATION AND DISCUSSION

1. Overall Evaluations

The data were categorized according to downtime (Section V.B.1), amount of soil processed (Section V.B.2), and cost (Section V.B.3). The data were then sorted by cause, month, component, interlock, etc. Outliers in the data, such as large downtime per month, number of downtime events per month, or costs were noted and their causes investigated.

a. Downtime

System downtime and that of specific components of the system are discussed in the following four subsections. In the first subsection, V.B.1.a, unscheduled maintenance of system components is tabulated. Most of the maintenance activities performed required that the feed auger be shut down. However, some maintenance was performed without the need to shut off the auger. Also, as explained in Section V.A (Data Evaluation), unless explicitly stated otherwise, the feed auger was assumed to remain on if the maintenance was completed within 20 minutes. System or component downtime is specified in two ways: (1) total maintenance time involved and (2) only that time where maintenance required shutdown of the feed auger. System instrumentation also contributed to shutdown of the feed auger, thus potentially the shutdown of the system. The computerized interlock system monitored the critical system operating parameters. Downtime caused by the interlock system is discussed in more detail in Section V.B.1.b. Scheduled maintenance data are discussed in Section V.B.1.c and total system downtime (i.e., feed auger off) is discussed in the Section V.B.1.d.

(1) Unscheduled Maintenance

A total of 899.06 hours of unscheduled maintenance time was experienced between November 25, 1987 and November 19, 1988. Table 1 is a monthly summary of the total unscheduled maintenance time, the number of events involved, and the average maintenance time per event. Table 1 also includes a list of the times during which the feed auger was off. Review of the data shows that the feed auger was off approximately 86% of the unscheduled maintenance time. A comparison of the unscheduled maintenance events that required the auger to be off with those with the auger on is shown in Figure 13.

The unscheduled maintenance time (hours) for each month of operation is displayed in Figure 14. These monthly totals include both

TABLE 1. MONTHLY UNSCHEDULED MAINTENANCE.

Month	Total Maintenance Time (h)	Number of Events (Total)	Average Maintenance Time (h)	Auger Downtime (Auger Off) (h)	Number of Events Downtime	Average Auger (h)
11/87	54.47	15	3.63	54.23	11	4.93
12/87	42.70	70	0.61	40.15	55	0.73
1/88	89.00	95	0.94	80.63	59	1.37
2/88	68.70	115	0.60	56.78	59	0.96
3/88	95.58	108	0.89	87.75	53	1.66
4/88	29.05	80	0.36	25.42	50	0.51
5/88	58.15	89	0.65	38.85	32	1.21
6/88	63.85	86	0.74	35.72	31	1.15
7/88	32.22	45	0.72	21.47	21	1.02
8/88	106.15[a]	36	2.95	89.97[a]	19	4.74
9/88	166.57[b]	54	3.08	159.98[b]	46	3.48
10/88	63.07	44	1.43	51.57	31	1.66
11/88	30.17	21	1.44	27.33	15	1.82
Total	899.06	858	1.05	769.85	482	1.60

a. 2.4 h downtime from power losses not included.
b. 64.5 h downtime from power losses and a hurricane alert not included.

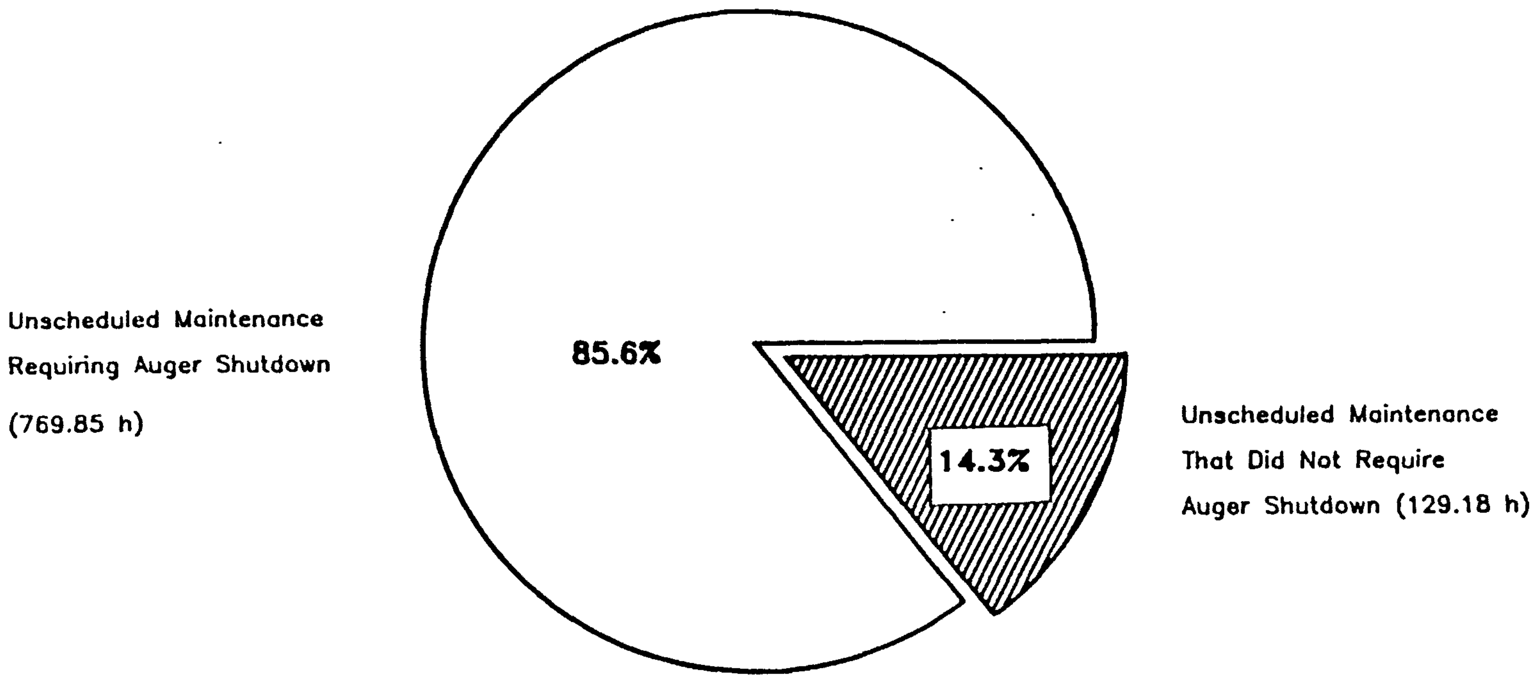

Figure 13. Comparison of Auger On-line and Off-line Time During Unscheduled Maintenance.

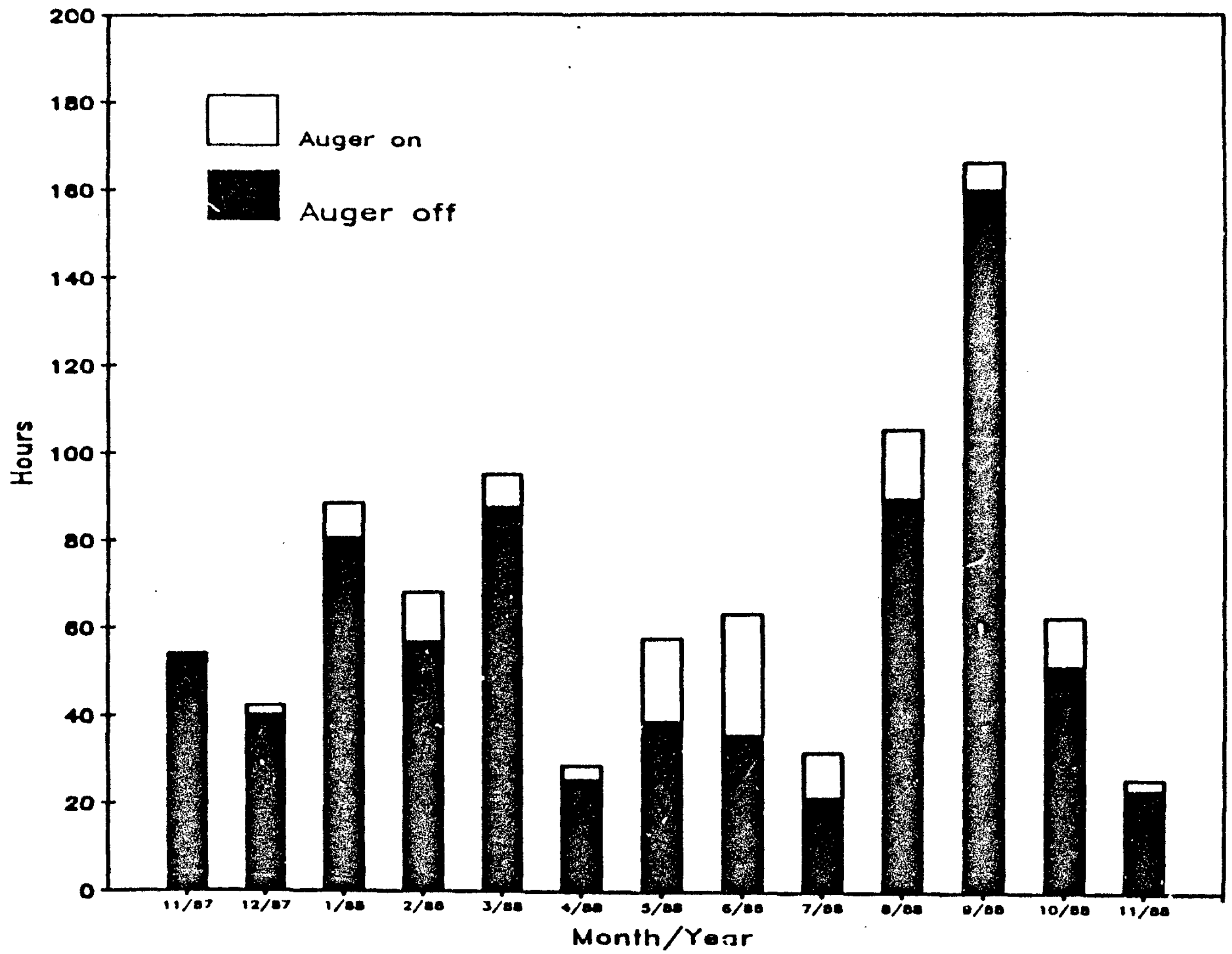

Figure 14. Monthly Unscheduled Maintenance Times.

the auger off-line time and the total maintenance time (auger on-line plus off-line time). Most of the maintenance was performed with the auger off except in May and June 1988. Unscheduled maintenance required considerable time in August and September 1988. During these months, the soil being fed to the incinerator contained more than the usual amount of metal and large rocks. This resulted in more frequent repair of the shredder and conveyor. (Also, area power failures and a hurricane alert contributed 2.4 hours of downtime in August and 64.5 hours in September. Downtime from these sources is not included in Table 1 or Figure 13).

The total number of unscheduled maintenance events for each month is displayed in Figure 15. The total number of events include both those events that require the auger to be shutdown plus those that did not require the auger to be shutdown. During the months of February through June of 1988, about one-half of the maintenance events did not cause the auger to be shut down.

Unscheduled maintenance events are listed by major component in Table 2. The data include the total unscheduled maintenance time attributed to each of the major components, the number of events, and the average time per event. Table 3 is a list of the mean time between failure for each of the major components. Also listed are the corresponding standard deviations and ranges. The system major component codes are defined in Table 4.

The total component unscheduled maintenance time (including both auger on-line and auger off-line hours) and the number of events listed in Table 2 are displayed in Figures 16 and 17, respectively. Several of the components did not require lengthy or frequent maintenance. For example, the boiler outlet (component 12) required no maintenance. The following components required maintenance eight or fewer times over the 12-month period of operation: the cyclones (07), divert tee (09), deaerator (11), quench elbow (13), ENT/quench tank (14), cross-over duct (15), scrubber jet (17), demister (19), stack (20), settling tank (22), raw water system (23), publicly owned treatment work (POTW) (24), cameras (25), treated water (26), and desilicizer (27).

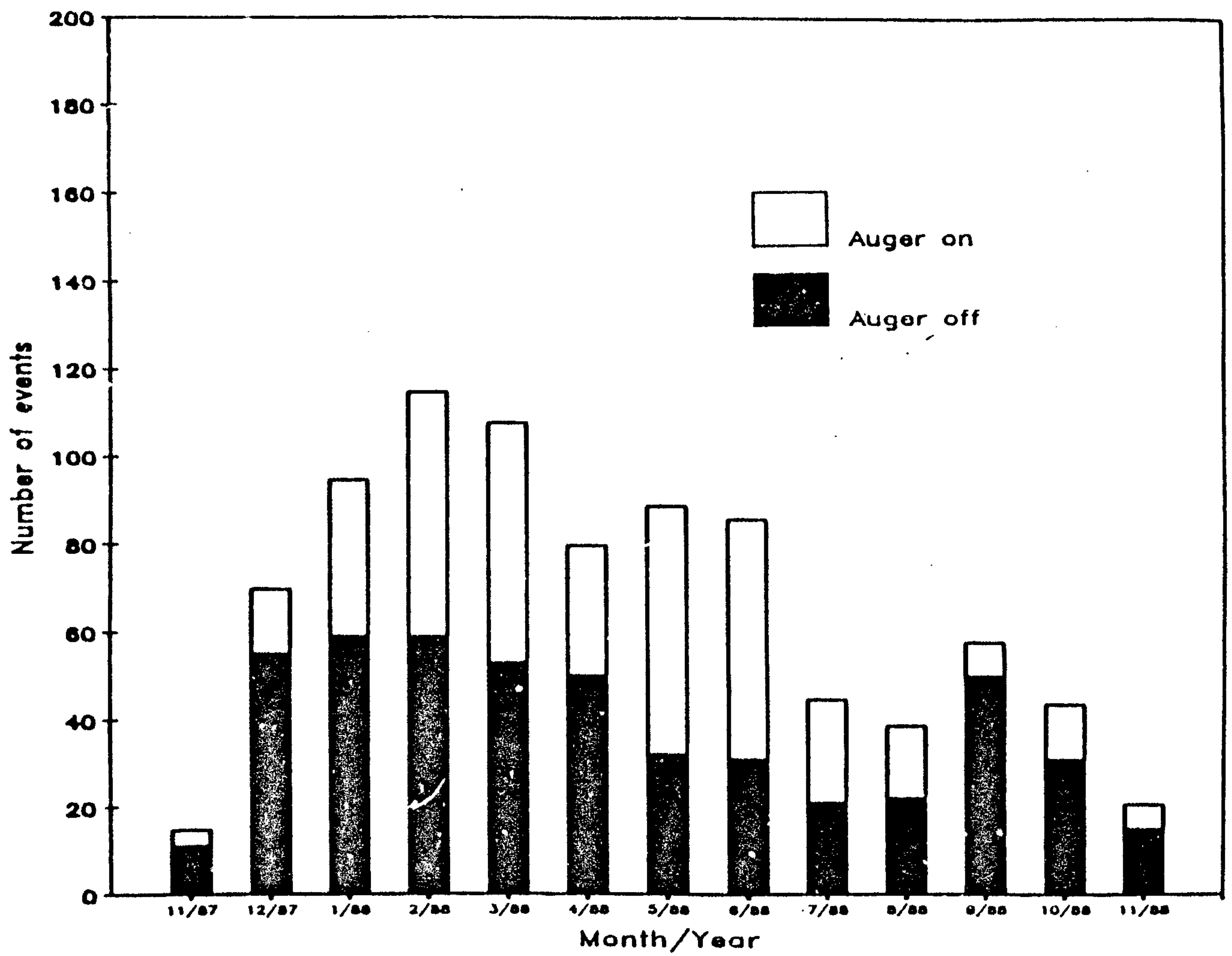

Figure 15. Monthly Unscheduled Maintenance Events.

TABLE 2. MAJOR COMPONENT UNSCHEDULED MAINTENANCE.

	Major Comp.	Total Time (h)	Number of Events (total)	Average Time (h)	Auger Downtime (h)	Number of Events (auger off)	Average Time (h)
	* 00	5.62	11	0.51	5.62	9	0.62
Weigh hopper	(01)	38.42	105	0.37	27.21	44	0.62
Shredder	(02)	158.64	126	1.26	150.08	69	2.18
Conveyor	(03)	87.95	62	1.42	84.58	41	2.06
Feed Hopper	(04)	68.25	68	1.00	66.13	57	1.16
Kiln	(05)	137.23	108	1.27	130.62	88	1.48
Ash drag	(06)	109.75	21	5.23	107.33	16	6.71
Cyclones	(07)	12.35	9	1.37	9.76	5	1.95
Secondary combustion chamber	(08)	38.91	24	1.62	38.73	23	1.68
Divert tee	(09)	1.50	3	0.50	0.50	1	0.25
Boiler	(10)	74.62	53	1.41	65.90	45	1.46
Deaerator	(11)	0.25	1	0.25	0.25	1	0.25
Boiler outlet	(12)	0.00	0	--	0.00	0	--
Quench elbow	(13)	0.17	1	0.17	0.17	1	0.17
ENT/Quench tank	(14)	7.80	6	1.30	2.13	1	2.13
Cross-over duct	(15)	0.17	1	0.17	0.00	0	--
Packed tower	(16)	28.48	27	1.05	19.00	8	2.38
Scrubber jet	(17)	0.65	2	0.33	0.65	2	0.33
Scrubber pump	(18)	31.66	18	1.76	23.17	4	5.79
Demister	(19)	0.17	1	0.17	0.00	0	--
Stack	(20)	2.48	5	0.50	2.30	4	0.58
Instrumentation	(21)	60.35	179	0.34	32.68	58	0.56
Settling tank	(22)	0.75	1	0.75	0.00	0	--
Raw water system	(23)	12.58	6	2.10	0.00	0	--
POTW	(24)	8.00	3	2.67	2.00	1	2.00
Cameras	(25)	4.13	9	0.46	0.92	3	0.31
Treated water	(26)	2.62	5	0.52	0.00	0	--
Desilicizer	(27)	5.50	3	1.83	0.00	0	--
Total		965.93	865	1.12	836.75	489	1.71

*Not attributed to a specific component

TABLE 3. MAJOR COMPONENT MEAN TIME BETWEEN FAILURE.

		Time Between Interruptions in Component Operation (Days)		
	Major Component	Mean	Standard Deviation	Range
	*00	21.8	25.5	[0,91]
Weigh hopper	(01)	3.2	6.9	[0,52]
Shredder	(02)	2.8	4.5	[0,26]
Conveyor	(03)	5.7	7.5	[0,32]
Feed hopper	(04)	4.8	10.0	[0,56]
Kiln	(05)	3.1	4.9	[0,37]
Ash drag	(06)	16.2	22.1	[0,67]
Cyclones	(07)	32.9	28.5	[7,82]
Secondary combustion chamber	(08)	14.4	16.7	[0,69]
Divert tee	(09)	139.0	130.1	[47,231]
Boiler	(10)	6.1	6.7	[0,33]
Deaerator	(11)	--	--	--
Boiler outlet	(12)	--	--	--
Quench elbow	(13)	--	--	--
ENT/quench tank	(14)	18.4	22.3	[2,50]
Cross-over duct	(15)	--	--	--
Packed tower	(16)	12.8	18.7	[0,62]
Scrubber jet	(17)	33.0	--	--
Scrubber pump	(18)	16.0	18.8	[0,63]
Demister	(19)	--	--	--
Stack	(20)	43.5	38.4	[0,92]
Instrumentation	(21)	2.1	4.5	[0,32]
Settling tank	(22)	--	--	--
Raw water system	(23)	23.0	28.0	[0,55]
POTW	(24)	75.0	76.4	[21,129]
Cameras	(25)	26.8	25.2	[0,77]
Treated water	(26)	61.5	95.4	[11,204]
Desilicizer	(27)	28.5	36.1	[3,54]
	Total	0.7	1.2	[0,91]

*Not attributed to a specific component

TABLE 4. MAJOR SYSTEM COMPONENT CODES.

---

01 - Weigh Hopper
    0101 - Scales
        010101 - Mechanical
        010102 - Digital

02 - Shredder
    0201 - Slide Gate
    0202 - Teeth
    0203 - Hydraulics
        020301 - Pump
        020302 - Hydraulic Motor
        020303 - Electrical Drive Motors
        020304 - Directional Solenoid
        020305 - Hoses
        020306 - Pressure Gauge
    0204 - Electrical Box

03 - Conveyor
    0301 - Belt
        030101 - Belt Wiper
    0302 - Rollers
    0303 - Idlers (Guides)
    0304 - Housing
    0305 - Actuators
    0306 - Electric Motor and Gear Box
    0307 - Drive Belt
    0308 - Drive Chain

04 - Feed Hopper
    0401 - Auger
        040101 - Bolts
        040102 - Water Jacket
    0402 - Vibrator
    0403 - Hydraulics (Auger Drive)
        040301 - Pump
        040302 - Hydraulic Motor
        040303 - Electrical Drive Motor
        040304 - Directional Solenoid
        040305 - Hoses
    0404 - Gear Box
    0405 - Sleeve
    0406 - RPM Indicator (Magnetic Pick-up)
    0407 - Bearing Block
        040701 - Bearings
    0408 - Adductor (Speed Control)
    0409 - Shaft
    0410 - Chute Water Jacket
    0411 - Electrical Components

TABLE 4. MAJOR SYSTEM COMPONENT CODES (CONTINUED).

- 05 - Kiln
  - 0501 - Webbco Seals
  - 0502 - Refractory
  - 0503 - Burners and Blowers
    - 050301 - Maxon Valve
    - 050302 - Burner Control
    - 050303 - Electric Motor
    - 050304 - Butterfly Valve
    - 050305 - Transmitter
    - 050306 - Blower Filters
    - 050307 - Bauman Valve
    - 050308 - Flame Eye (Purple Peeper)
    - 050309 - Draft Snubber
    - 050310 - Natural Gas High Relief Valve
  - 0504 - Trunnions
    - 050401 - Bearings
  - 0505 - Thrust Bearings
  - 0506 - Hydraulics
    - 050601 - Pump
    - 050602 - Hydraulic Motor
    - 050603 - Electric Drive Motor
    - 050604 - Directional Solenoid
    - 050605 - Drive Sprocket
      - 05060501 - Chain
    - 050606 - Pinion Gear
    - 050607 - Adductor
    - 050608 - Pressure Filter System
  - 0507 - Outlet Gas Release
  - 0508 - Ash Outlet Duct
    - 050801 - Refractory
  - 0509 - Outlet O_2

- 06 - Ash drag
  - 0601 - Hydraulics
    - 060101 - Drive Motor
    - 060102 - Pump
    - 060103 - Electric Drive Motor
    - 060104 - Directional Solenoid
    - 060105 - Sprockets
      - 06010501 - Drive Chain
  - 0602 - Drag Chain
    - 060201 - Bearings
  - 0603 - Flights
  - 0604 - Pan

- 07 - Cyclones
  - 0701 - Drop Legs
  - 0702 - Vibrators
  - 0703 - Vortex Tube (Finder)
  - 0704 - Refractory
  - 0705 - Cross-Over Duct
    - 070501 - Slide Gates

TABLE 4. MAJOR SYSTEM COMPONENT CODES (CONTINUED).

08 - Secondary Combustion Chamber
  0801 - Refractory
  0802 - Burners and Blowers
    080201 - Maxon Valve
    080202 - Burner Control
    080203 - Electric Motor
    0802C4 - Butterfly Valve
    080205 - Transmitter
    080206 - Blower Filter
    080207 - Bauman Valve
    080208 - Flame Eye (Purple Peeper)

09 - Divert Tee
  0901 - Refractory
  0902 - Pneumatic Adductor
  0903 - Spray Nozzles
  0904 - Quench Pump
  0905 - Steam Nozzles

10 - Boiler
  1001 - Tubers
  1002 - Boiler Face
  1003 - Inspection Hatches
  1004 - Level Indicator
  1005 - Steam Drum
    100501 - Blowdown Drum
      10050101 - Blowdown Lines and Valves
  1006 - Safety Valves
  1007 - Muffler
  1008 - Boiler Feed Water Pumps
    100801 - Electric Motors
    100802 - Automatic Valve
    100803 - Strainers

11 - Deaerator
  1101 - Regulators
  1102 - Pumps
    110201 - Seals
  1103 - Motors
  1104 - Treated Water Tank
  1105 - Deaerator Drum

12 - Boiler Outlet
  1201 - Refractory
  1202 - Inspection Cover

13 - Quench Elbow
  1301 - Spray Nozzles

TABLE 4. MAJOR SYSTEM COMPONENT CODES (CONTINUED).

14 - ENT/Quench Tank
- 1401 - Mixer
- 1402 - Quency Pumps
  - 140201 - Motors
  - 140202 - Seals
  - 140203 - Strainers
- 1403 - Transfer Pumps
  - 140301 - Motors
  - 140302 - Seals
- 1404 - Mud Transfer Pump
  - 140401 - Motors
  - 140402 - Seals
- 1405 - Lines and Valves

15 - Cross-Over Duct
- 1501 - Slide Gate

16 - Packer Tower
- 1601 - Pumps
  - 160101 - Motors
  - 160102 - Seals
  - 160103 - Block Valves
  - 160104 - Check Valves
  - 160105 - Strainers
- 1602 - Demister Pad
- 1603 - Tellerettes
- 1604 - Grating
- 1605 - Fiber Glass Tower

17 - Scrubber Jet (Hydrosonic Jet)
- 1701 - Spray Nozzles

18 - Scrubber Pump
- 1801 - Pumps
  - 180101 - Motors
  - 180102 - Seals
  - 180103 - Steam Valves and Piping
  - 180104 - Water Valves and Piping
  - 180105 - Strainers
- 1802 - Sump
  - 180201 - Lines AND Valves

19 - Demister
- 1901 - Demister Pads
- 1902 - Tank
  - 190201 - Lines and Valves

20 - Stack
- 2001 - Stack Sampling System (CO, CO_2, O_2)

TABLE 4. MAJOR SYSTEM COMPONENT CODES (CONTINUED).

21 - Instrumentation
- 2101 - Panel Instruments
- 2102 - Computer
  - 210201 - Disk Drives
  - 210202 - Monitor
  - 210203 - Printer
  - 210204 - Keyboard
  - 210205 - Software
- 2103 - Stack Analyzers
  - 210301 - O_2 Analyzer
  - 210302 - CO Analyzer
  - 210303 - CO_2 Analyzer
- 2104 - Strip Chart Recorders
- 2105 - Motor Controls
- 2106 - Instrument Controls
- 2107 - Power Convertors
- 2108 - Valves
- 2109 - Pressure Transmitters
- 2110 - Flow Transmitters
- 2111 - Delta Pressure Transducer
- 2112 - Thermocouples
- 2113 - Gauges
- 2114 - pH Probes
- 2115 - Instrument Air Compressor
- 2116 - System Air Compressor

22 - Settling Tank
- 2201 - Pump
  - 220101 - Seals
  - 220102 - Electric Motor
  - 220103 - Lines and Valves

23 - Raw Water System
- 2301 - Tank
- 2302 - Pumps
  - 230201 - Electric Motors
  - 230202 - Seals
  - 230203 - Lines and Valves
  - 230204 - Strainers

24 - POTW
- 2401 - Carbon Bed
- 2402 - Storage Tanks
- 2403 - Pumps
  - 240301 - Electric Motors
  - 240302 - Seals
  - 240303 - Lines and Valves

TABLE 4. MAJOR SYSTEM COMPONENT CODES (CONCLUDED).

25 - Cameras
- 2501 - Weigh Hopper
- 2502 - Conveyor
- 2503 - Feed Hopper
- 2504 - Ash Drag
- 2505 - Steam Drum Level

26 - Treated Water
- 2601 - Tank
- 2602 - Level Switches
- 2603 - Pump
  - 260301 - Electric Motor
  - 260302 - Seals
  - 260303 - Lines and Valves
  - 260304 - Strainers

27 - Desilicizer
- 2701 - Caustic Pump
- 2702 - Tank
- 2703 - Lines and Valves

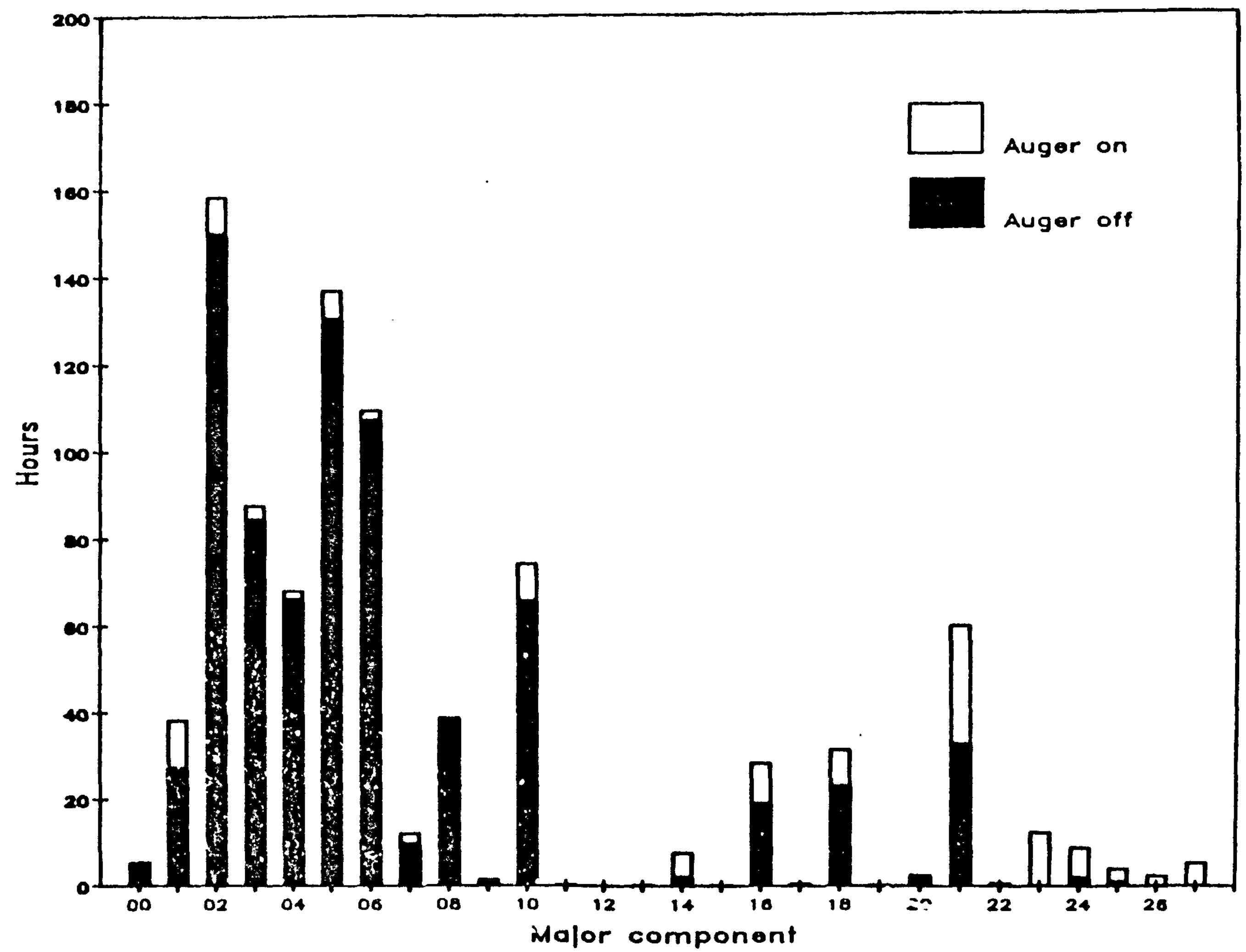

Figure 16. Component Unscheduled Maintenance Times.

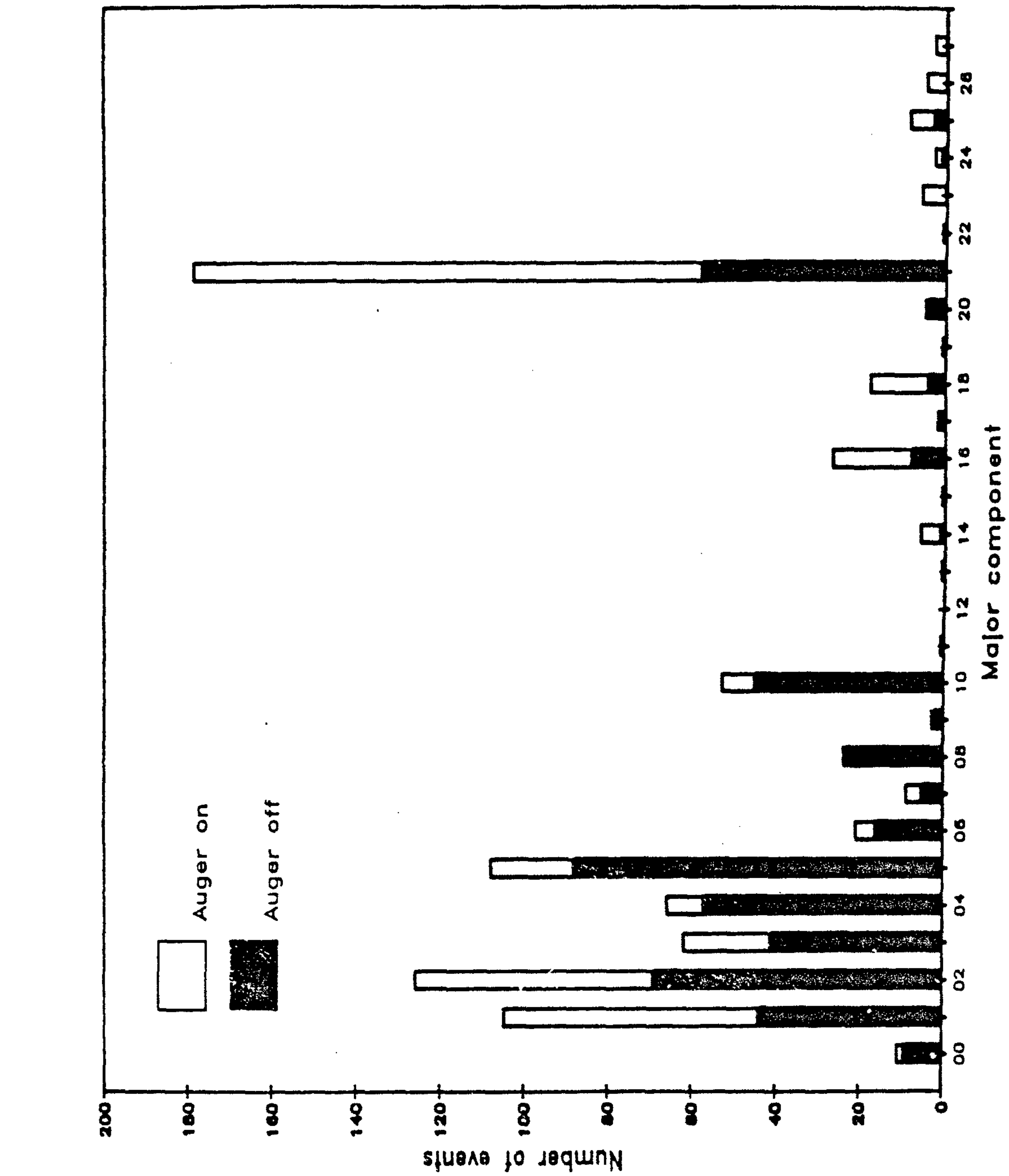

Figure 17. Component Unscheduled Maintenance Events.

However, the shredder (02), kiln (05), and ash drag (06) caused the auger to be shut down more than 100 hours (158.97 hours, 137.25 hours, and 109.75 hours, respectively). Four components - the hopper, shredder, kiln, and instrumentation (components 01, 02, 05, and 21, respectively) - were the main contributors to the number of unscheduled maintenance events with more than 100 events each. Monthly data for the five components (weigh hopper, shredder, kiln, ash drag, and instrumentation) are listed in Tables 5 through 9. These data are displayed in Figures 18 through 27.

The monthly unscheduled maintenance hours for the shredder are displayed in Figure 19. The largest monthly maintenance time (77.6 hours, 49% of total) was reported in August 1988. This is a factor of five larger than the maintenance time for the shredder during all other months except September 1988. On August 27 and 28, the auger was shut down to remove metal from the shredder teeth. On August 29, the shredder overheated and stopped working several times. No reason for overheating was given. Later that day, the shredder hydraulic system gear box broke. At this time, a new shredder was ordered. The installation of the new shredder was not completed until September 2, 1988. A total of about 94 hours was credited to unscheduled maintenance in August and September that was attributed to shredder problems.

Figure 27 is a plot of the monthly number of maintenance events for the system instrumentation. Many events were reported between February and July of 1988. The average event time was only about 20 minutes and, during nearly 70% of the events, the auger was not shutdown.

The average times between interruptions [mean time between failure (MTBF)] in component operation, whether the auger was on- or off-line, are listed in Table 3. Also shown in Table 3 are corresponding values for the standard deviation and range. Seven of the components [weigh hopper (01), shredder (02), conveyor (03), feed hopper (04), kiln (05), boiler (10), and instrumentation (21)] required maintenance more than 50 times during the

TABLE 5. MONTHLY WEIGH HOPPER UNSCHEDULED MAINTENANCE.

Month	Total Maintenance Time (h)	Number Events (total)	Auger Downtime (h)	Number of Events (auger off)
11/87	0.80	3	0.72	2
12/87	4.98	15	4.25	8
1/88	8.50	28	7.08	15
2/88	5.53	26	3.20	4
3/88	2.43	10	0.90	3
4/88	1.78	6	0.67	4
5/88	4.05	7	0.58	2
6/88	0.57	2	0.53	1
7/88	0.25	2	0.00	0
8/88	0.00	0	0.00	0
9/88	3.30	3	3.05	2
10/88	6.23	3	6.23	3
11/88	0.00	0	0.00	0
Total	38.42	105	27.21	44

TABLE 6. MONTHLY SHREDDER UNSCHEDULED MAINTENANCE.

Month	Total Maintenance Time (h)	Number Events (total)	Auger Downtime (h)	Number of Events (auger off)
11/87	0.05	1	0.00	0
12/87	5.97	7	5.83	6
1/88	14.92	15	14.23	8
2/88	6.48	24	3.85	6
3/88	5.40	23	3.08	6
4/88	1.63	8	1.42	5
5/88	1.90	7	1.65	4
6/88	4.42	8	3.17	5
7/88	2.72	7	1.80	5
8/88	77.63	13	77.53	11
9/88	33.43	8	33.43	8
10/88	1.23	2	1.23	2
11/88	3.18	4	3.18	4
Total	158.96	127	150.40	70

TABLE 7. MONTHLY KILN UNSCHEDULED MAINTENANCE.

Month	Total Maintenance Time (h)	Number Events (total)	Auger Downtime (h)	Number of Events (auger off)
11/87	19.48	4	19.48	4
12/87	15.67	31	15.67	31
1/88	3.23	7	3.23	7
2/88	12.03	6	12.03	6
3/88	28.23	19	27.87	16
4/88	6.73	12	6.73	15
5/88	1.93	4	1.93	4
6/88	2.55	9	0.05	1
7/88	2.[illegible]	5	0.00	0
8/88	0.50	1	0.00	0
9/88	43.45	7	43.20	6
10/88	0.93	3	0.43	2
11/88	0.00	0	0.00	0
Total	137.23	108	130.62	88

TABLE 8. MONTHLY ASH DRAG UNSCHEDULED MAINTENANCE.

Month	Total Maintenance Time (h)	Number Events (total)	Auger Downtime (h)	Number of Events (auger off)
11/87	18.53	2	18.53	2
12/87	0.00	0	0.00	0
1/88	0.00	0	0.00	0
2/88	0.00	0	0.00	0
3/88	38.97	7	38.97	6
4/88	0.00	0	0.00	0
5/88	0.00	0	0.00	0
6/88	12.33	3	11.58	2
7/88	0.00	0	0.00	0
8/88	0.67	2	0.00	0
9/88	26.08	3	26.08	3
10/88	1.67	1	1.67	1
11/88	11.50	3	10.50	2
Total	109.75	21	107.33	16

TABLE 9. MONTHLY INSTRUMENTATION UNSCHEDULED MAINTENANCE.

Month	Total Maintenance Time (h)	Number Events (total)	Auger Downtime (h)	Number of Events (auger off)
11/87	0.00	0	0.00	0
12/87	4.00	3	4.00	3
1/88	3.17	5	2.67	4
2/88	4.77	8	3.43	6
3/88	4.72	27	3.73	8
4/88	6.58	33	6.55	16
5/88	9.65	37	6.90	6
6/88	9.75	29	.85	3
7/88	2.98	14	1.32	3
8/88	3.25	4	0.00	0
9/88	1.83	1	0.00	0
10/88	8.30	15	2.30	7
11/88	1.35	3	0.93	2
Total	60.35	179	32.68	58

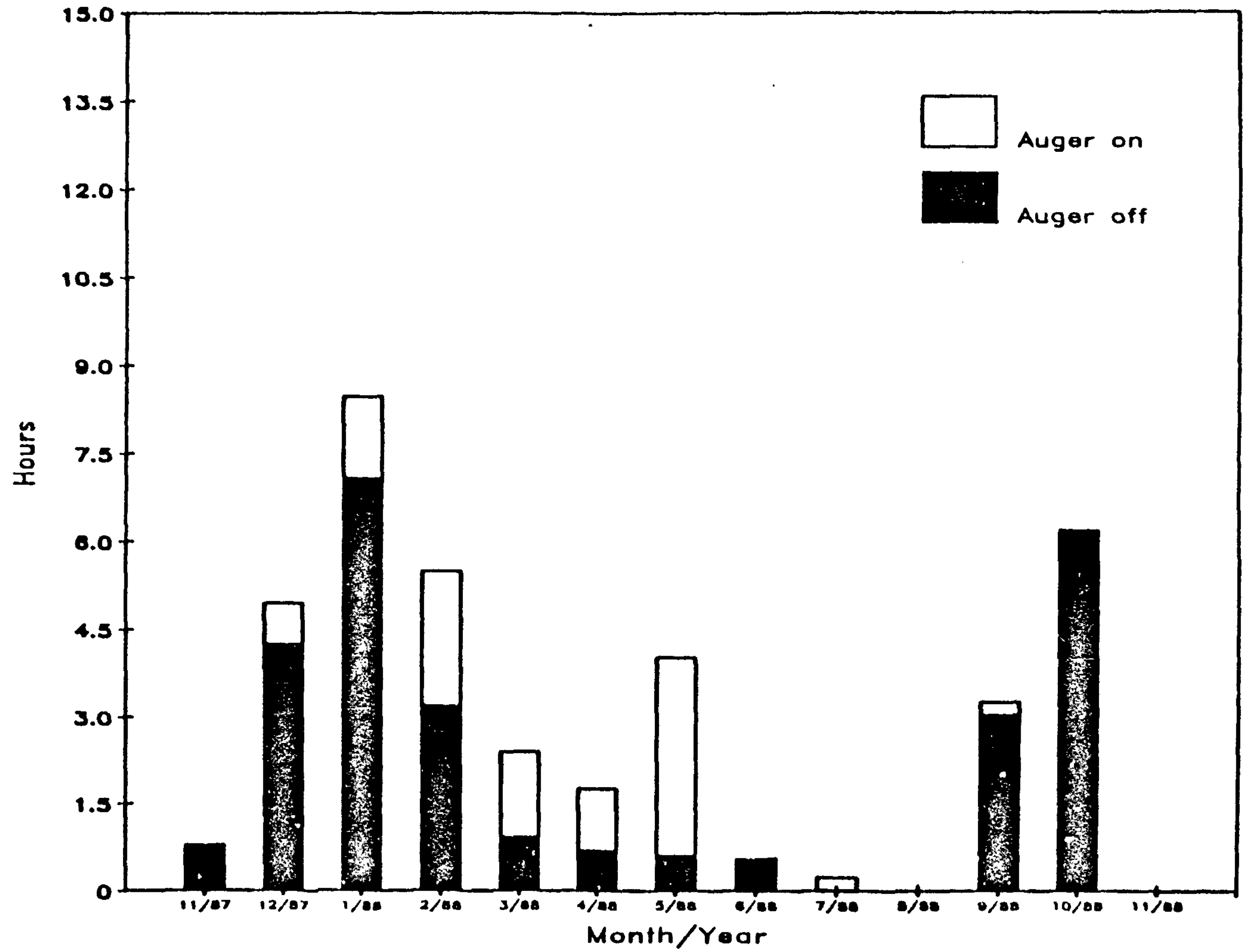

Figure 18. Monthly Unscheduled Maintenance Times for the Weigh Hopper.

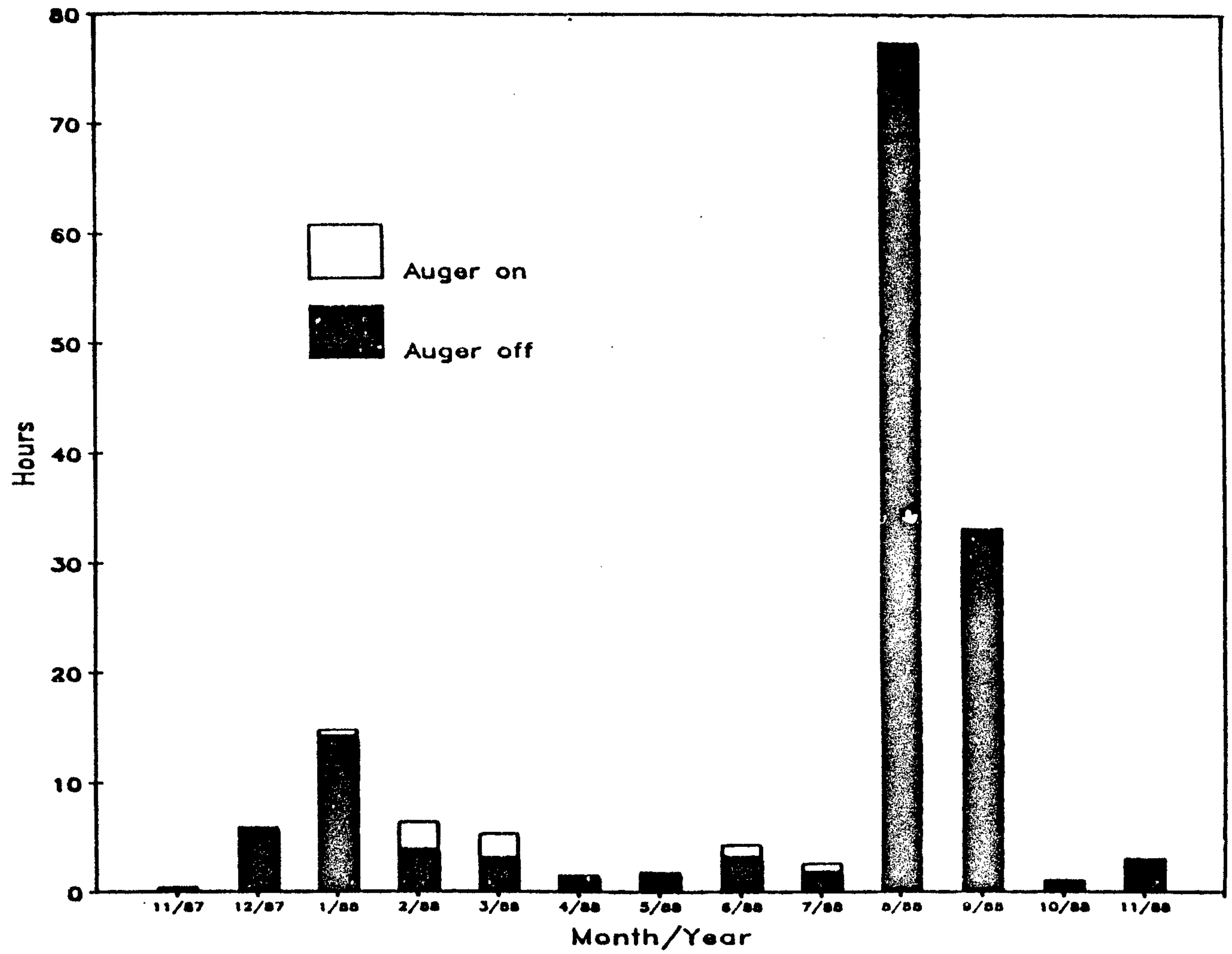

Figure 19. Monthly Unscheduled Maintenance Times for the Shredder.

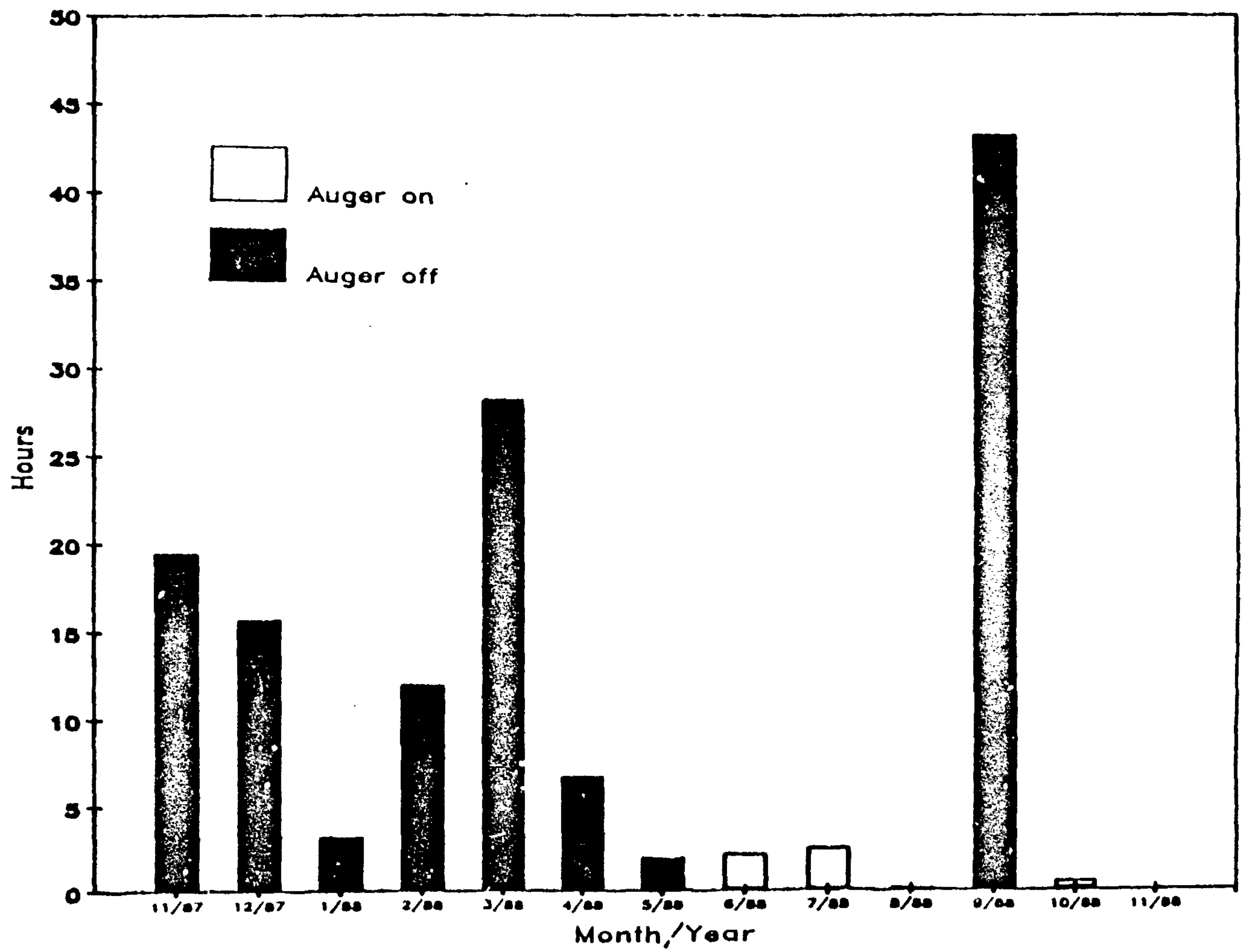

Figure 20. Monthly Unscheduled Maintenance Times for the Kiln.

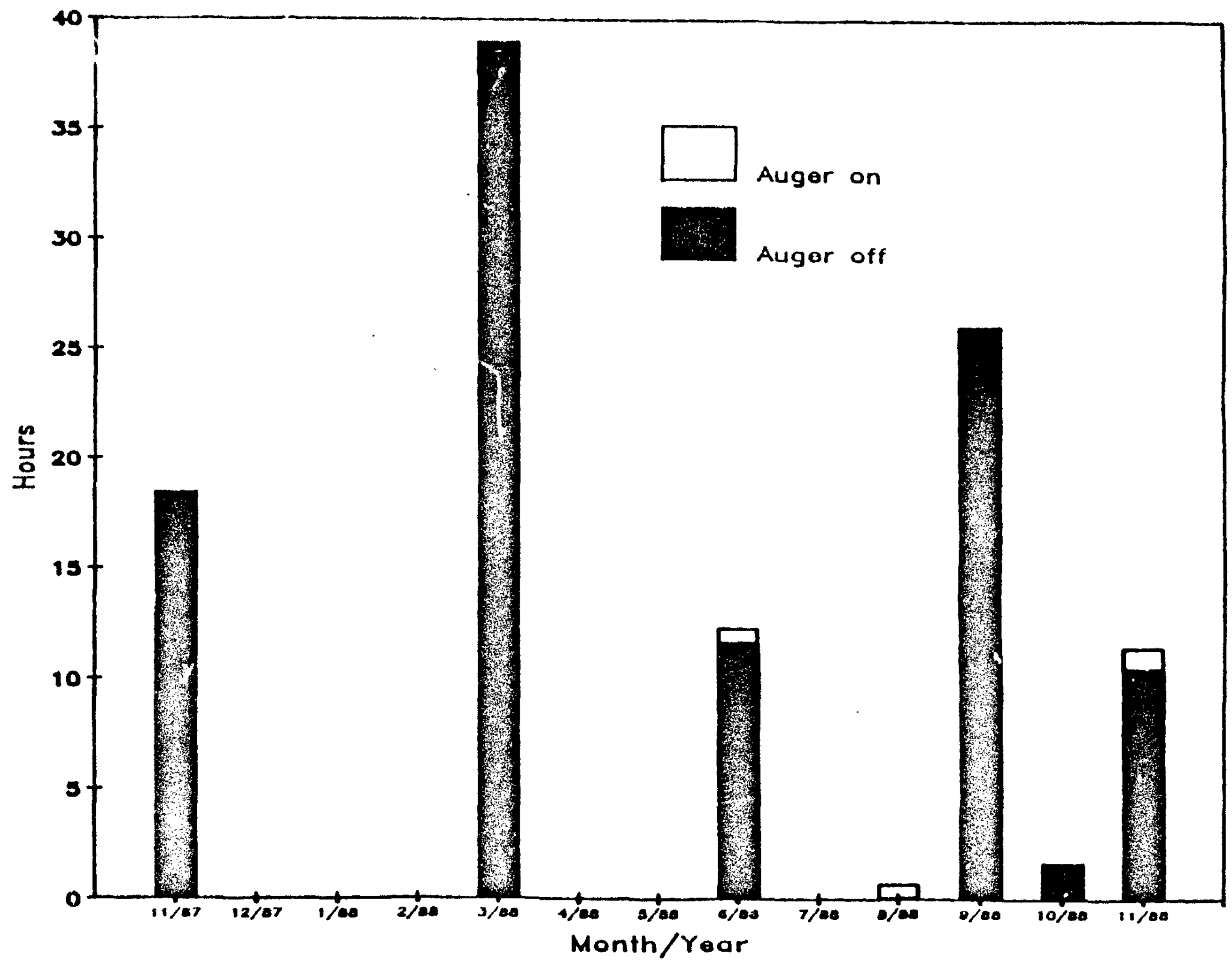

Figure 21. Monthly Unscheduled Maintenance Times for the Ash Drag.

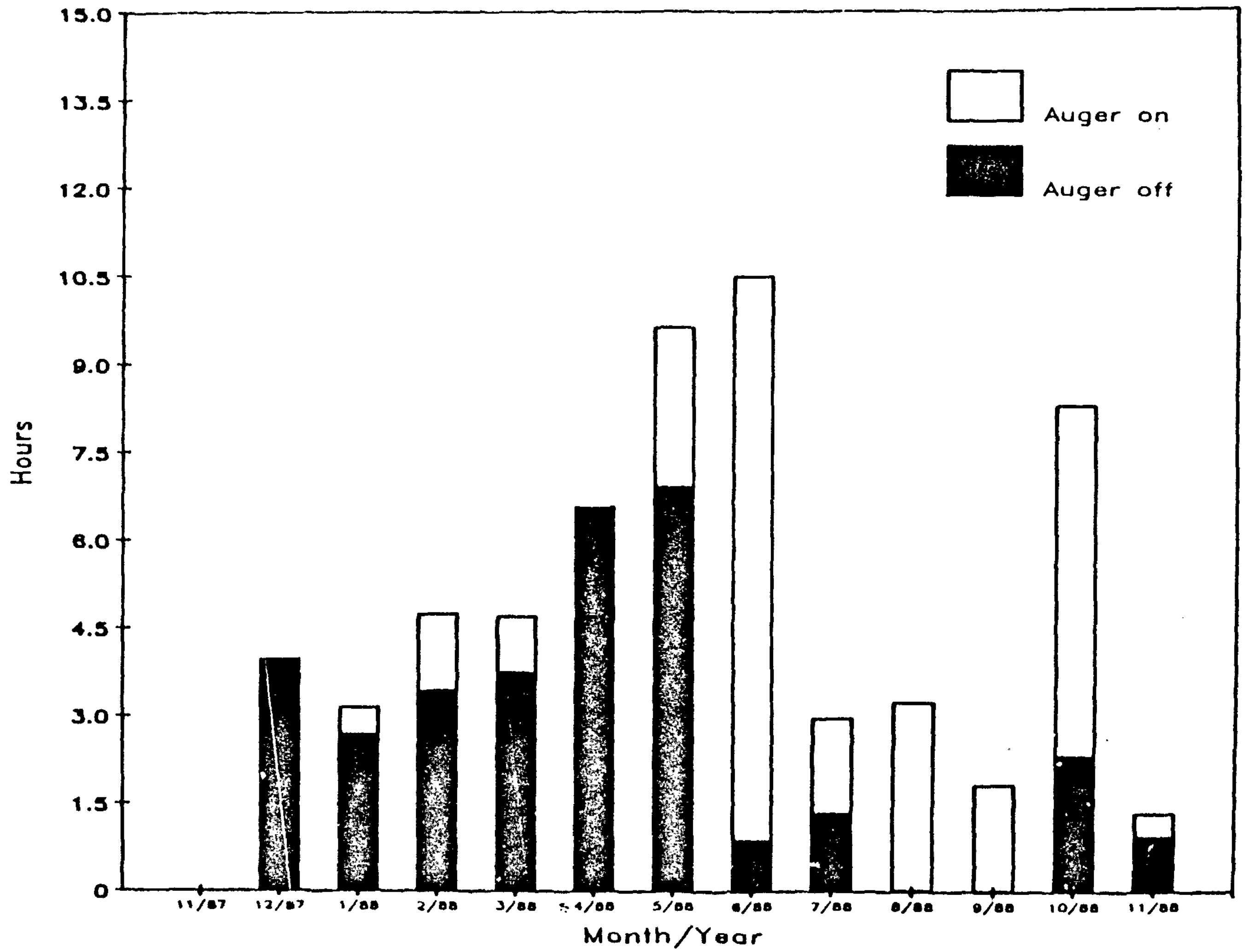

Figure 22. Monthly Unscheduled Maintenance Times for the Instrumentation.

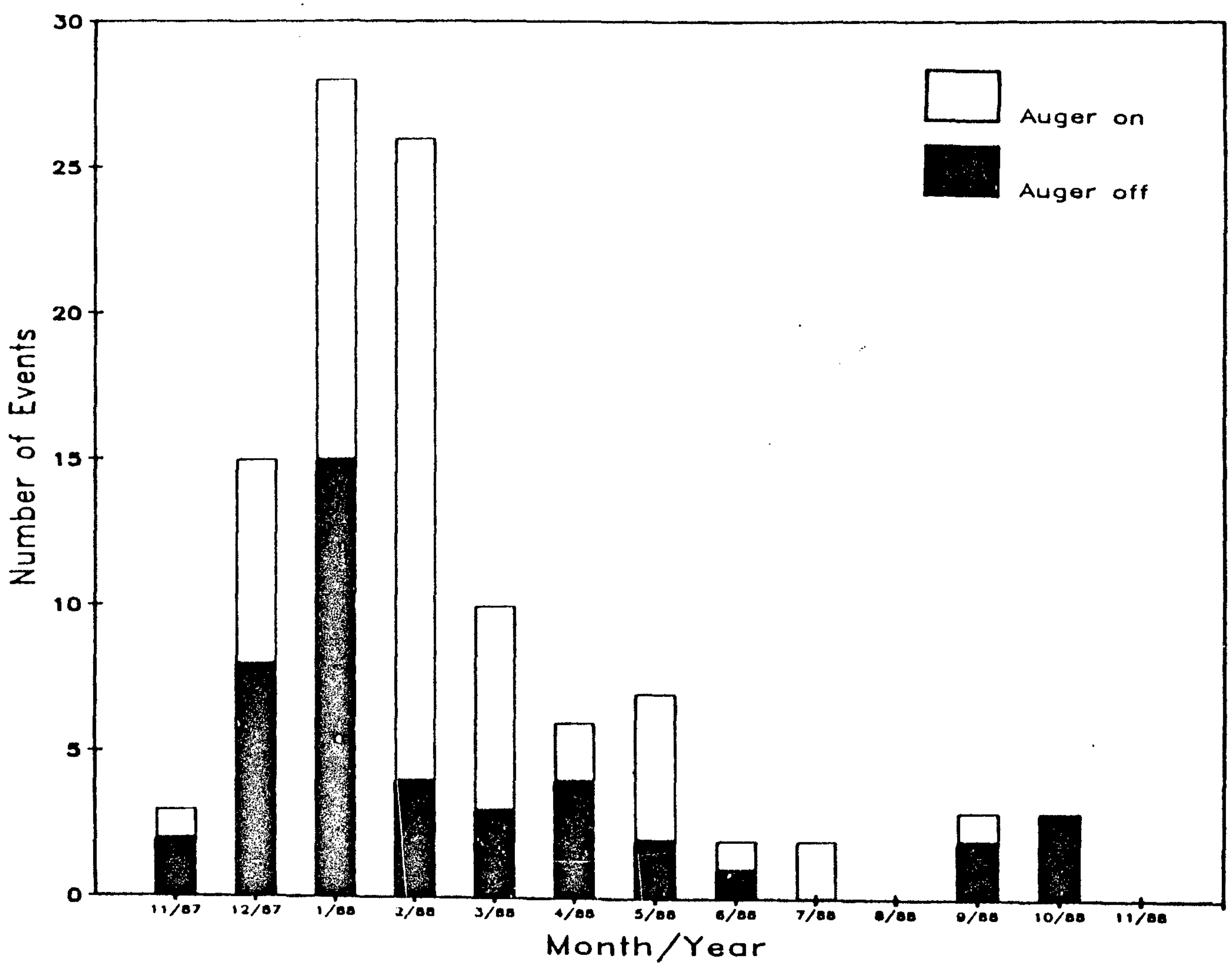

Figure 23. Monthly Unscheduled Maintenance Events for the Weigh Hopper.

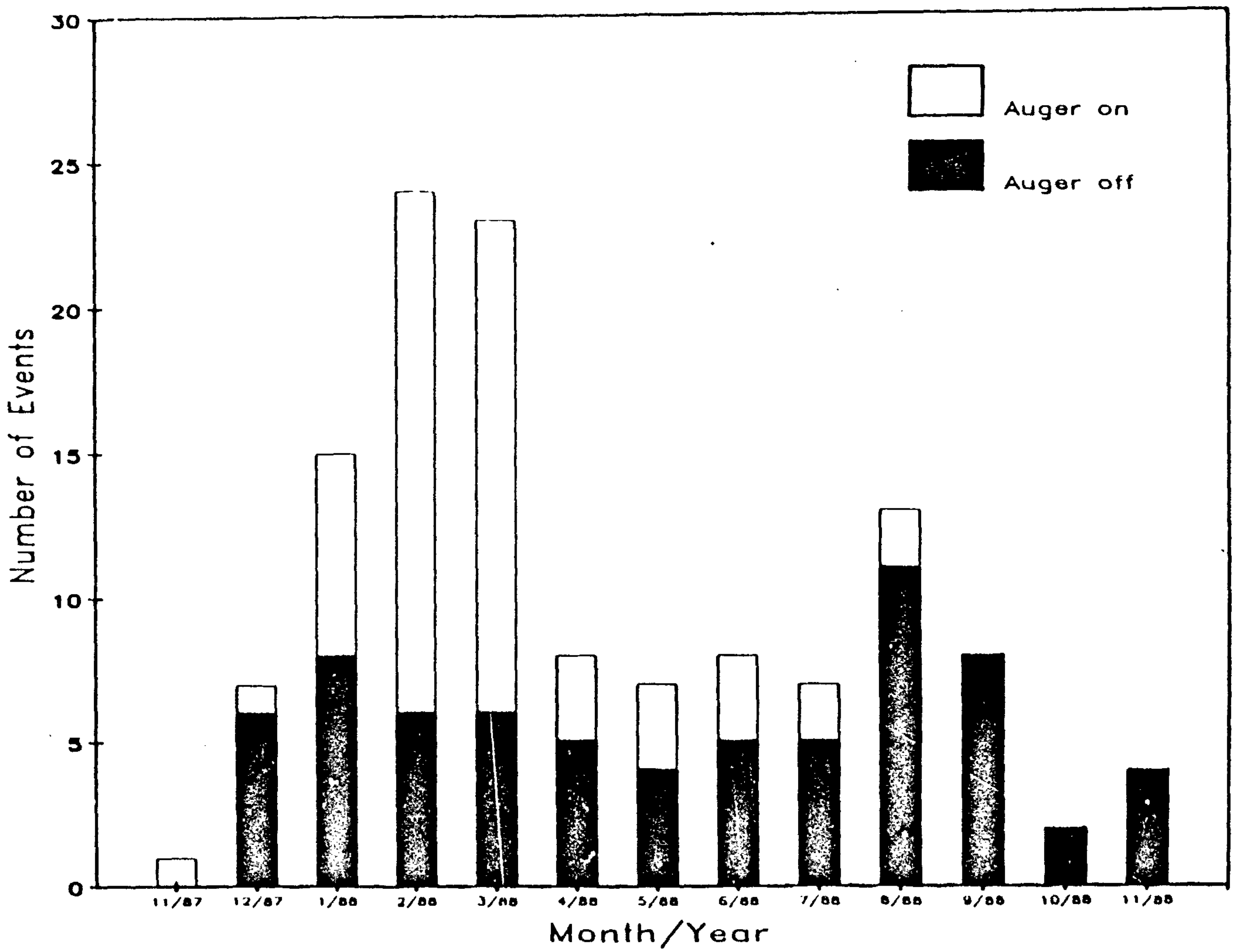

Figure 24. Monthly Unscheduled Maintenance Events for the Shredder.

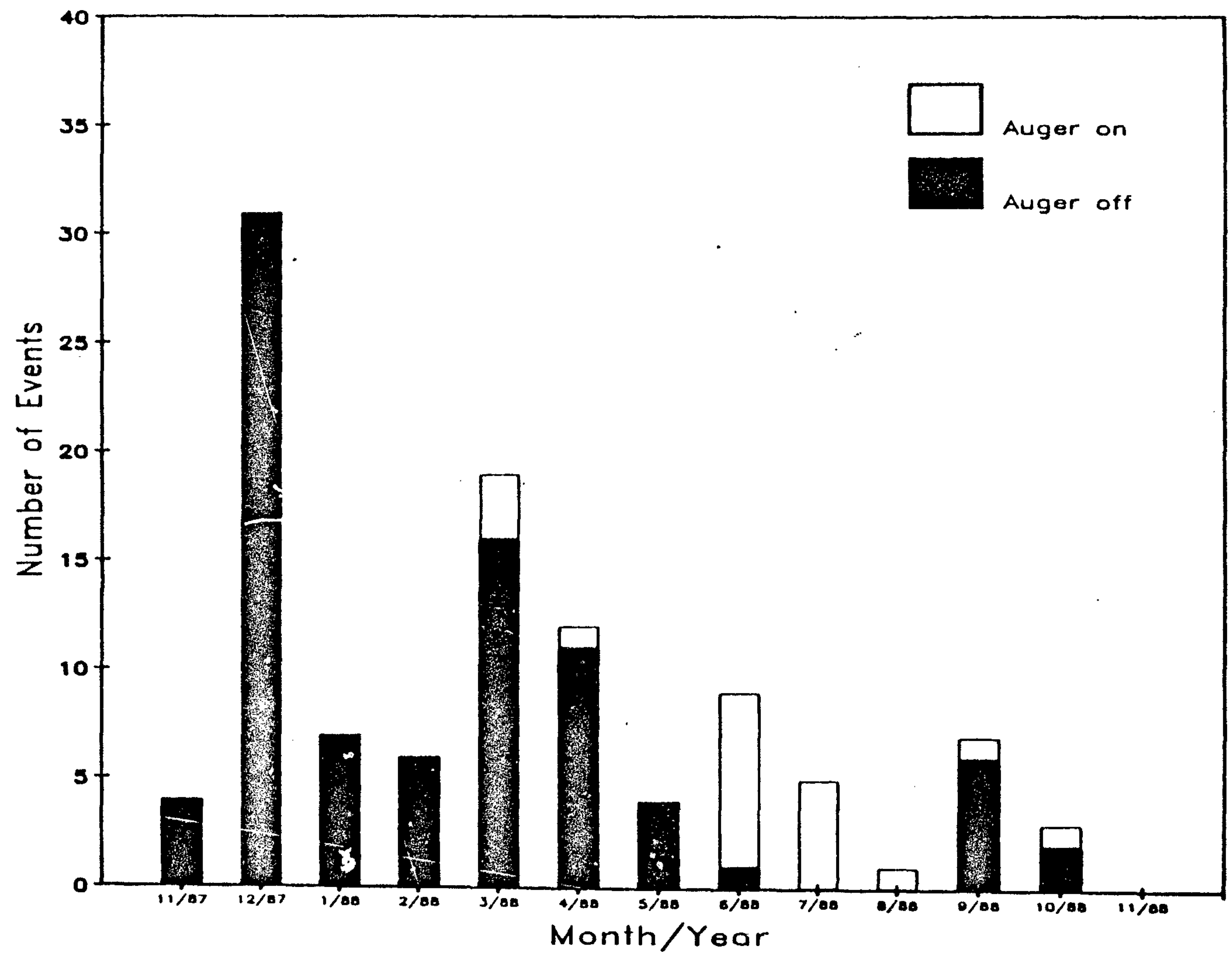

Figure 25. Monthly Unscheduled Maintenance Events for the Kiln.

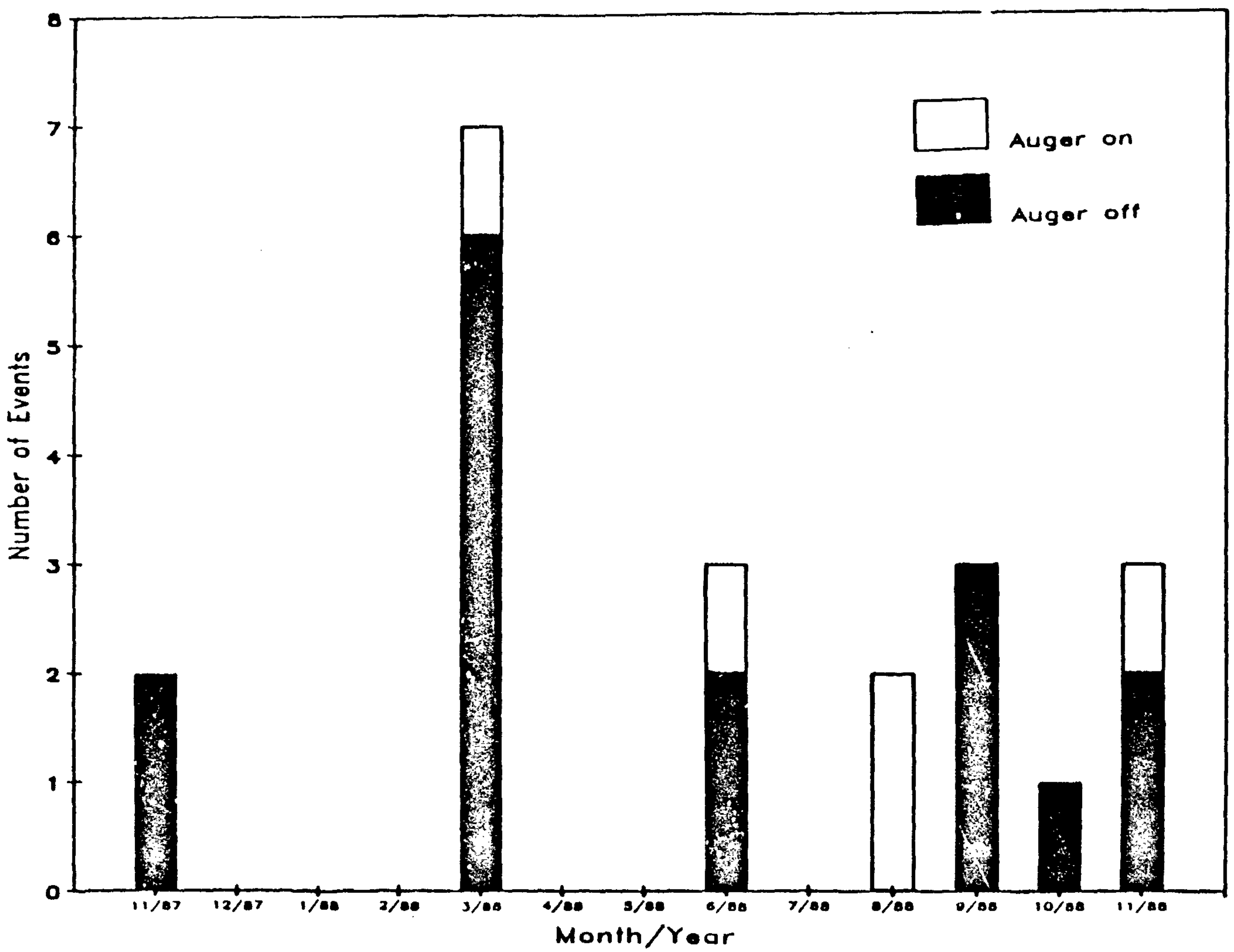

Figure 26. Monthly Unscheduled Maintenance Events for the Ash Drag.

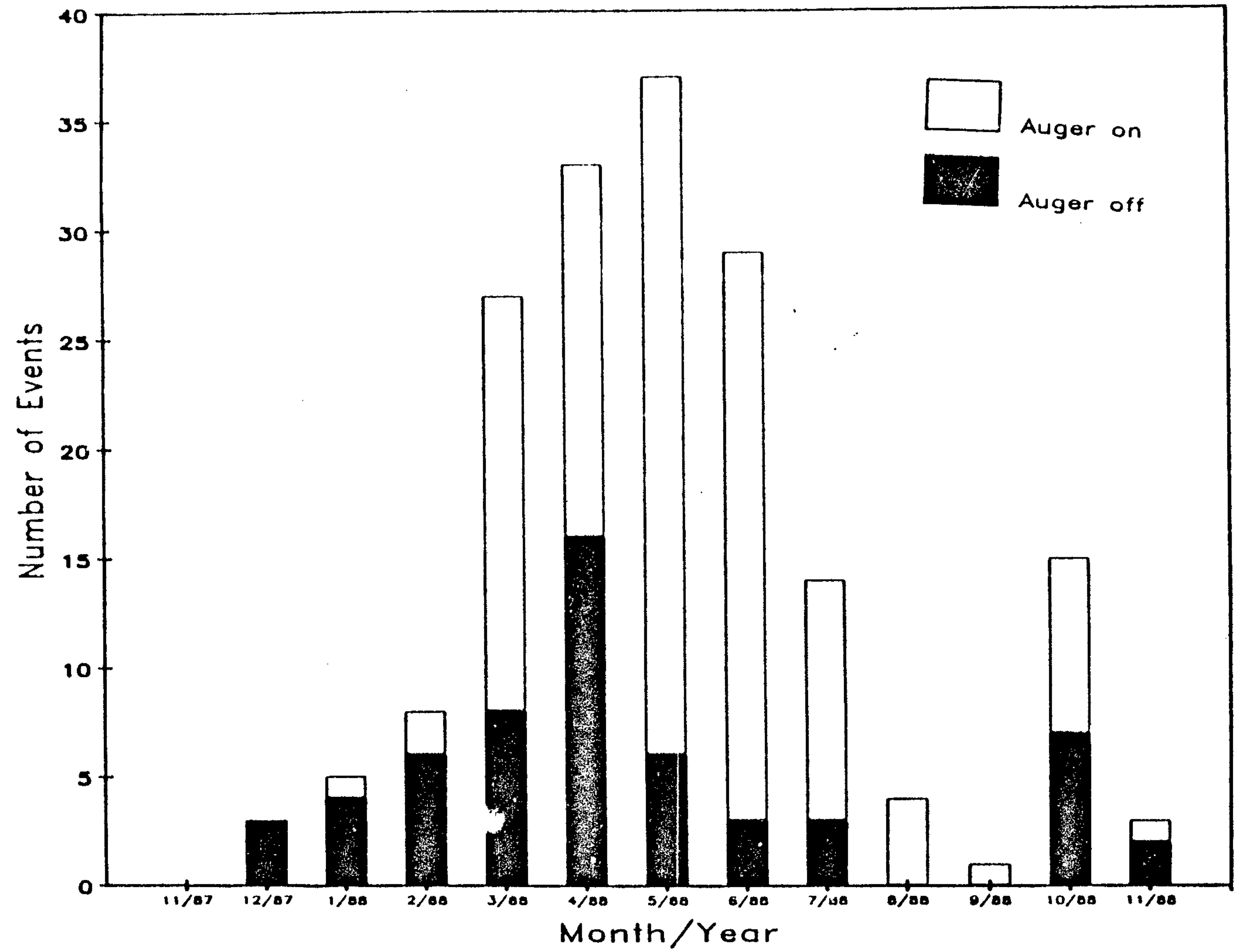

Figure 27. Monthly Unscheduled Maintenance Events for Instrumentation.

12-month operating period. The MTBF of each of these components was less than 7 days. Overall, the average time between component failure was 0.7 days, with a standard deviation of 1.2 days and a range of 0 to 9 days. The MTBF data show that the weigh hopper, shredder, kiln, and system instrumentation required the most frequent maintenance. The conveyor, feed hopper, and boiler also required frequent maintenance for problems such as plugging, binding, and fouling (e.g., buildup on boiler face plate). However, the total number of maintenance events related to these components was less than half that of the total for the weigh hopper, shredder, kiln, and instrumentation.

(2) Interlocks

Auger instrumentation interlock events contributed significantly to the system downtime. These interlocks provide for operation of the system within prescribed permit operating limits through the monitoring of specified system parameters. Table 10 is a list of the interlocks monitored along with codes used to identify them. Table 11 contains the downtime and number of system interlock events for each month of operation. Figures 28 and 29 display the downtime associated with the system interlock events and the number of interlock events that occurred, respectively, for each month of operation. The largest downtime was recorded during the months of December 1987 and April 1988. About 30% of the downtime in December was attributed to the low kiln outlet temperature (LKOT) interlock. In April, over 60% of the downtime was caused by the high average feed rate (HAFR) interlock. The largest number of events occurred in December 1987 and February 1988. The LKOT and the low retention time (LRT) interlocks contributed more than half of the events in February.

The downtime, the number of events, and the average downtime for each interlock are listed in Table 12. Figures 30 and 31 display the interlock downtime and number of events, respectively. The HAFR and LKOT interlocks accounted for 56% of the total number of events and 65% of the total downtime. Two other interlocks also occurred

TABLE 10. AUGER INTERLOCK CODE IDENTIFICATION.

Code	Interlock
CE	Combustion efficiency
COA	CO analyzer out
HAFR	High average feed rate
HARPM	High auger RPM
HCO	High CO
KOTB	Kiln outlet temperature burnout
KTSO	Kiln temperature sensor out
LKOD	Low kiln outlet draft
LKOT	Low kiln outlet temperature
LO2	Low oxygen
LPTR	Low packed tower recirculation
LRT	Low retention time
LSOT	Low secondary outlet temperature
SRL	Scrubber recirculation low
STBO	Secondary temperature burnout
STSO	Secondary temperature sensor out

TABLE 11. MONTHLY INTERLOCK EVENTS.

Month	Downtime (h)	Number of Interlocks	Average Downtime (min)
11/87	5.22	130	2.4
12/87	78.13	2,445	1.9
1/88	17.98	1,466	0.7
2/88	39.03	2,318	1.0
3/88	42.78	1,585	1.6
4/88	54.08	1,622	2.0
5/88	31.72	1,348	1.4
6/88	16.23	785	1.2
7/88	20.28	676	1.8
8/88	18.82	522	2.2
9/88	26.77	599	2.7
10/88	33.80	690	2.9
11/88	8.53	275	1.9
Total	393.37	14,461	1.6

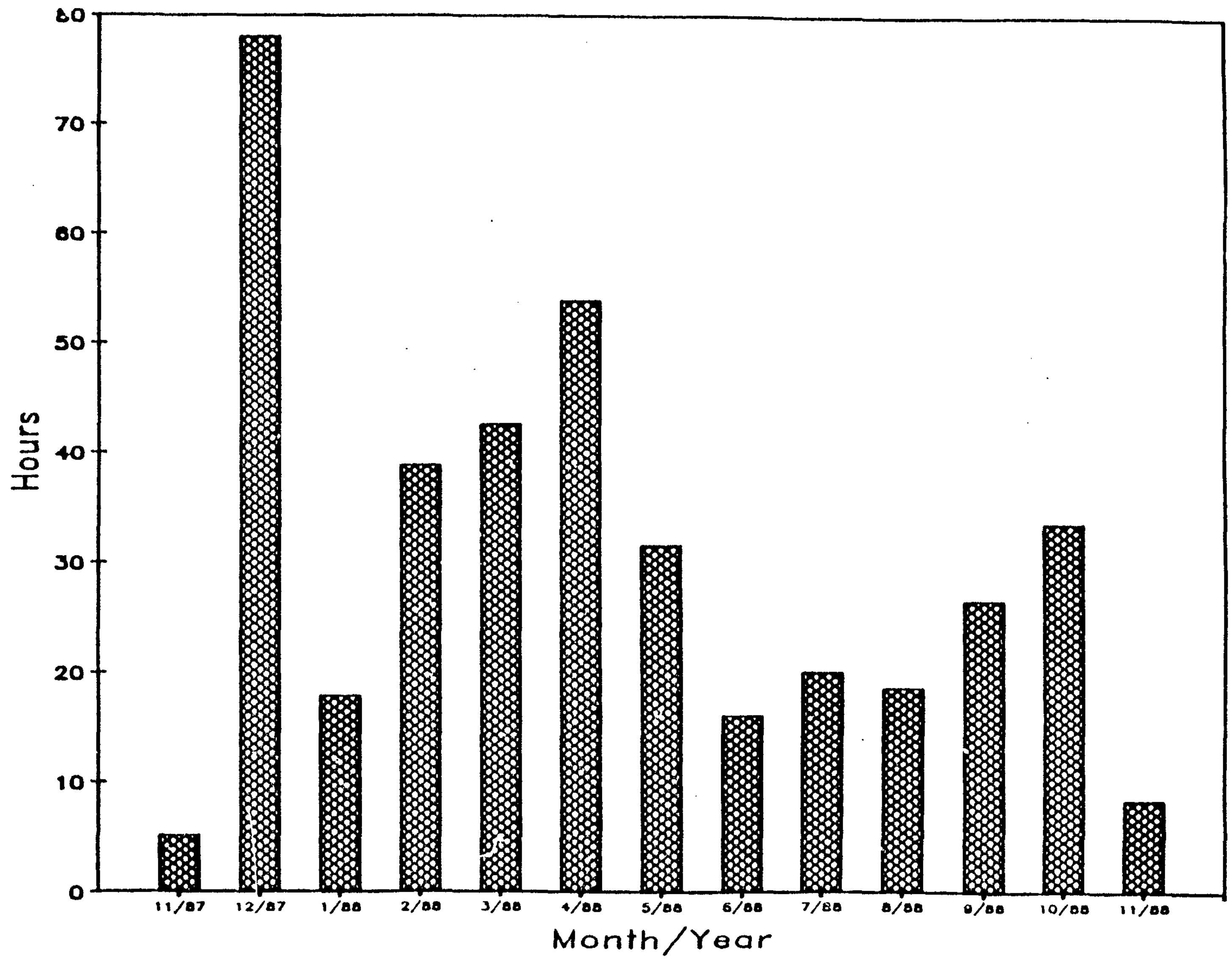

Figure 28. Monthly Downtime from Interlocks.

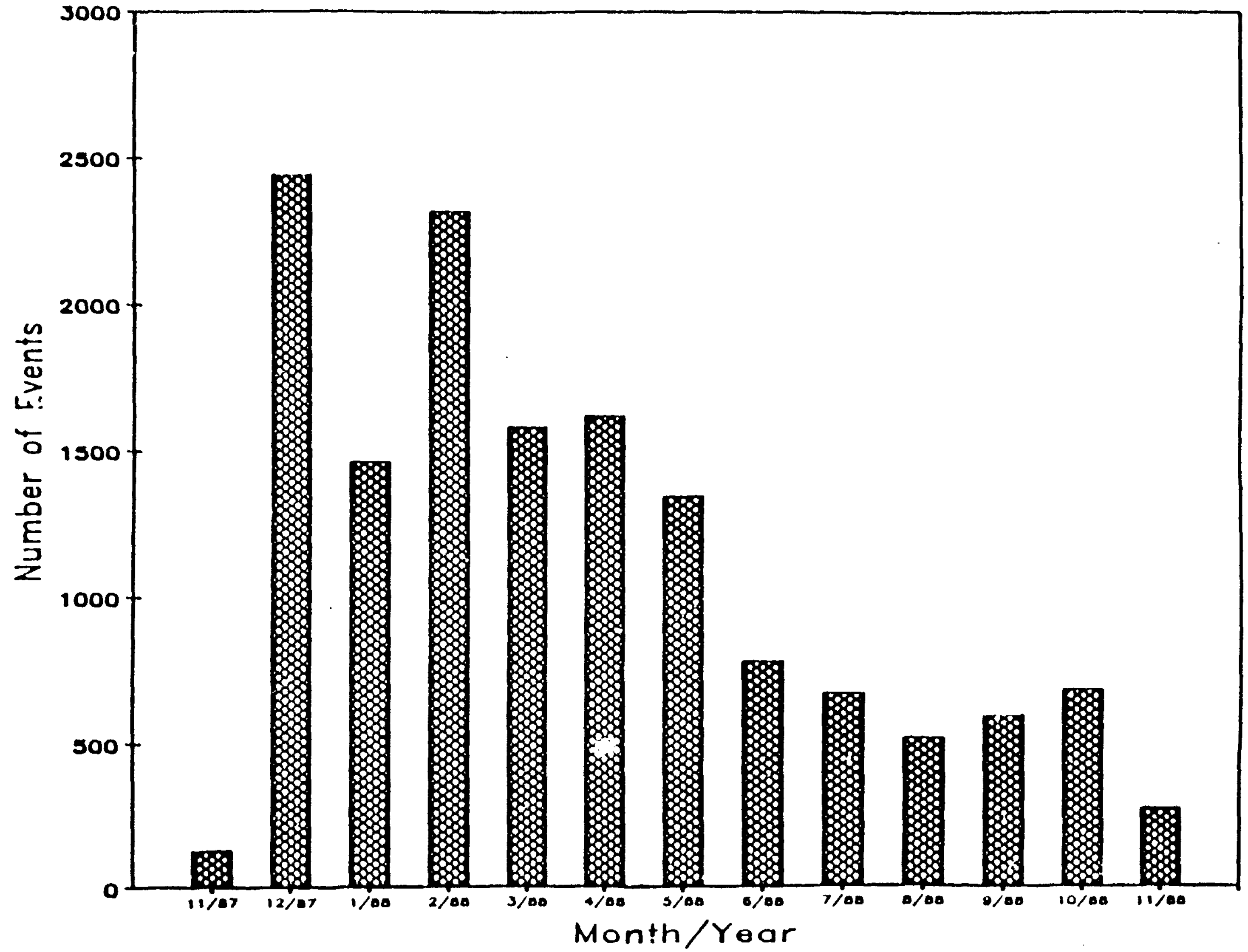

Figure 29. Monthly Interlock Events.

TABLE 12. INDIVIDUAL INTERLOCK DOWNTIME.

	Interlock	Downtime (h)	Number Interlocks	Average Downtime (min)
Combustion Efficiency	(CE)	12.18	282	2.6
Carbon Monoxide Analyzer Out	(COA)	0.72	90	0.48
High Average Feed Rate	(HAFR)	180.35	4961	2.2
High Auger RPM	(HARPM)	15.82	181	5.2
High Carbon Monoxide	(HCO)	37.15	647	3.4
Kiln Outlet Temperature Burnout	(KOTB)	0.87	76	0.68
Kiln Temperature Sensor Out	(KTSO)	0.02	1	1.2
Low Kiln Outlet Draft	(LKOD)	14.48	2471	0.35
Low Kiln Outlet Temperature	(LKOT)	75.03	3145	1.4
Low Oxygen	(LO2)	9.37	410	1.4
Low Packed Tower Recirculation	(LPTR)	1.87	95	1.2
Low Retention Time	(LRT)	16.45	1425	0.69
Low Secondary Outlet Temperature	(LSOT)	26.73	480	3.3
Scrubber Recirculation Low	(SRL)	1.67	185	0.54
Secondary Temperature Burnout	(STBO)	0.63	10	3.8
Secondary Temperature Sensor Out	(STSO)	0.03	2	1.0
	Total	393.37	14,461	1.6

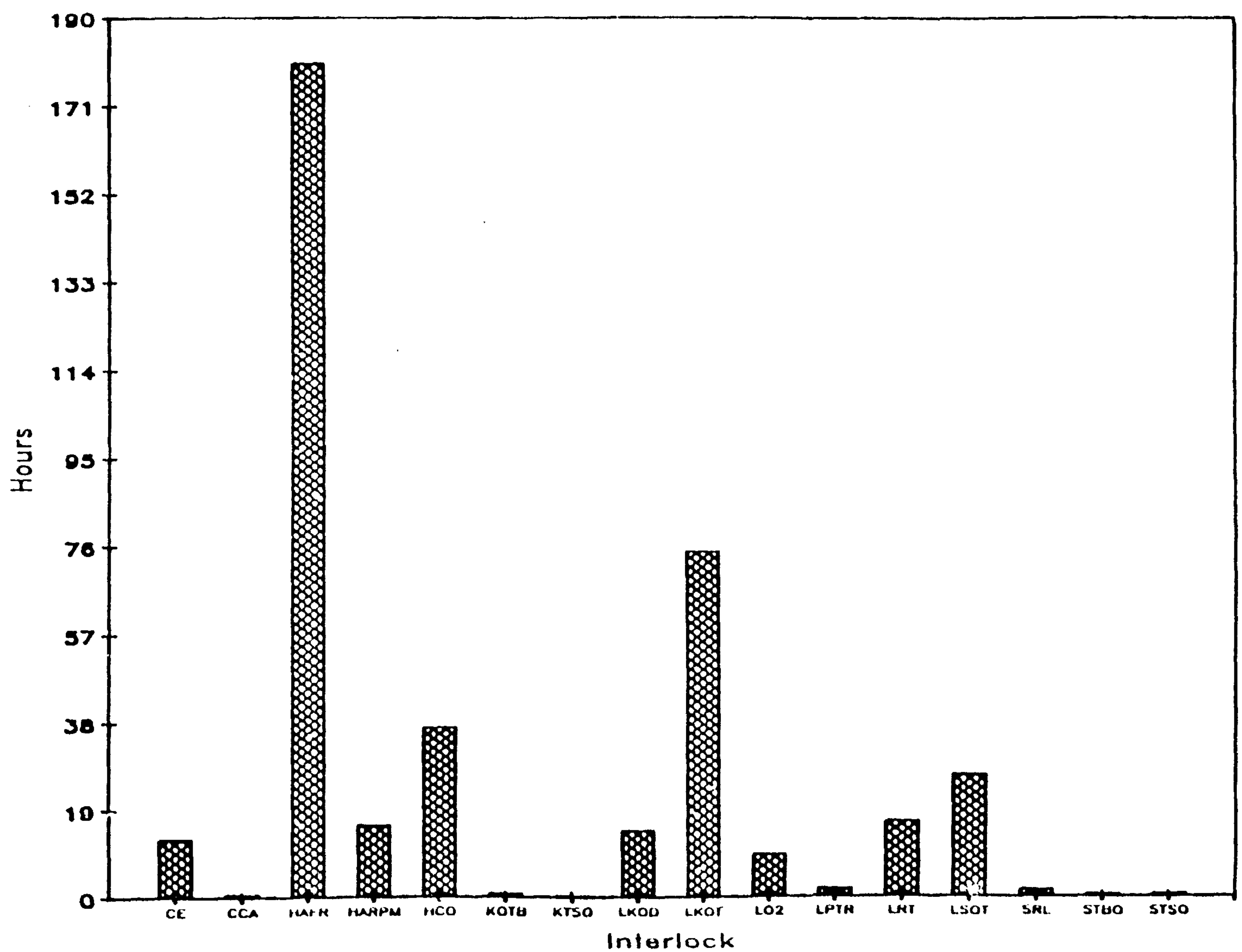

Figure 30. Interlock Downtime.

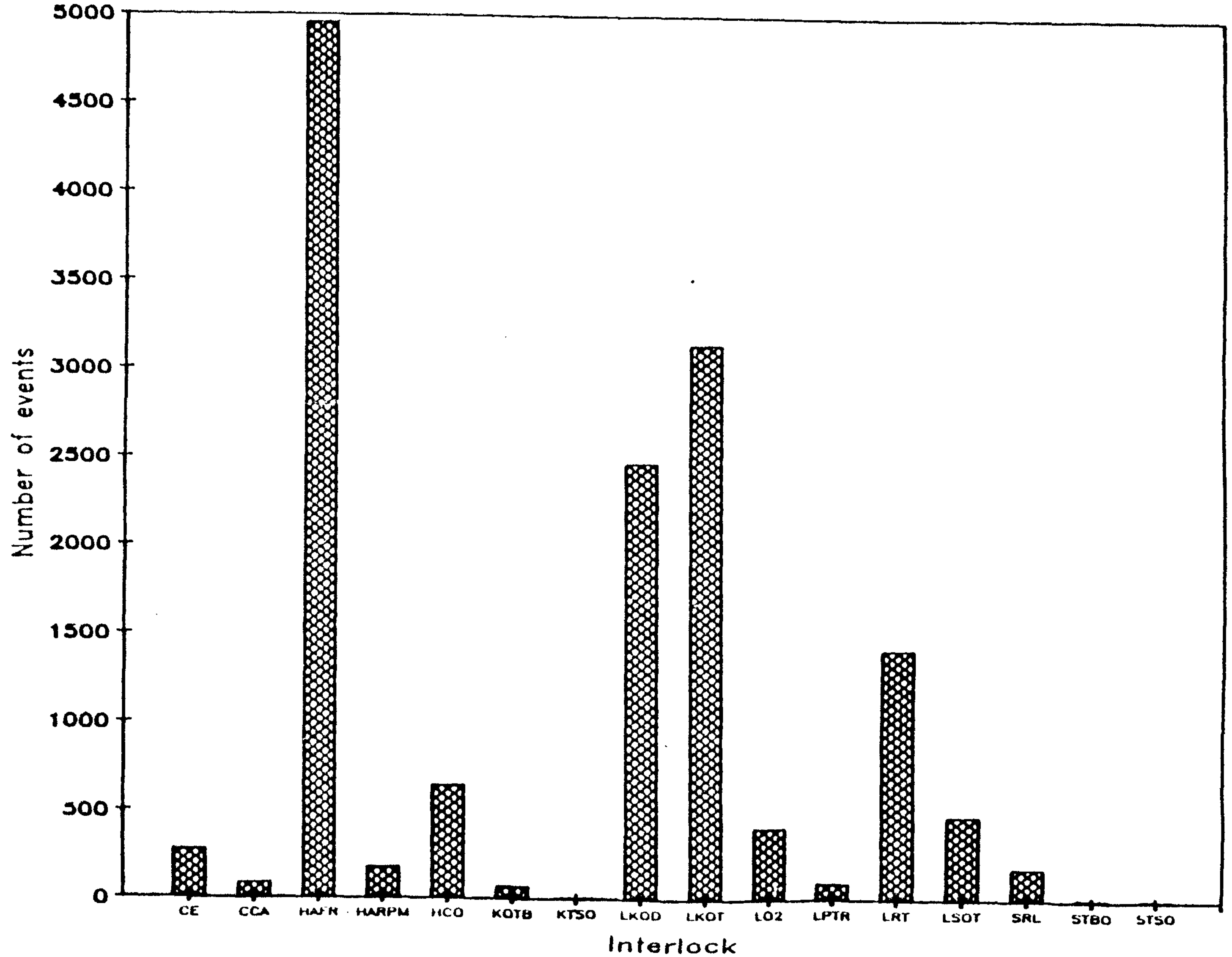

Figure 31. Interlock Events.

frequently--low-kiln outlet draft (LKOD) and low retention time (LRT). Combined, the four interlocks accounted for 83% of the interlock events and 73% of the downtime. Tables 13 through 16 contain the monthly downtime and number of events for each of these interlocks. Over the 359 days of operation used as a basis for this evaluation, on the average, 1.1 hours per day of downtime was experienced with a daily average of about 40 system interlock events.

By far the largest contributor to downtime was the HAFR interlock, with an interlock occurring nearly every day. The number of HAFR interlocks per month (Table 13) began to decrease in March 1988. At that time an instantaneous feed readout feature was added to the computer program. This allowed the operators to maintain more control on the quantity of soil they were feeding to the incinerator. Although there was a decrease in the number of HAFR interlocks, an increase in the total downtime and the downtime per interlock resulted.

For the LKOD, LKOT, and LRT interlocks (Tables 14, 15, and 16), the number of events and the downtimes started high and then began to decline around April or May 1988. Thus, it can be inferred that as the program progressed, equipment stabilized, and experience was gained, the system operation was affected less by these instrumentation interlock events. The data in Tables 14 and 15 show that the kiln outlet draft and kiln outlet temperature were harder to maintain. They both experienced a large number of events; however, LKOT accounted for more system downtime.

(3) Scheduled Maintenance

Scheduled maintenance was maintenance performed on equipment during the scheduled outages. The scheduled outages were performed when the quantity of particulate in the SCC reached 25% of SCC capacity.

TABLE 13. MONTHLY HAFR INTERLOCKS.

Month	Downtime (min)	Number of Interlocks	Average Downtime (min)
11/87	0	0	--
12/87	80	449	0.18
1/88	157	540	0.29
2/88	607	1212	0.50
3/88	1114	296	3.76
4/88	2050	659	3.11
5/88	1376	411	3.35
6/88	752	183	4.11
7/88	669	139	4.81
8/88	650	152	4.28
9/88	1092	305	3.58
10/88	1890	539	3.51
11/88	384	76	5.05
Total	10,821	4,961	2.18

TABLE 14. MONTHLY LKOD INTERLOCKS.

Month	Downtime (min)	Number of Interlocks	Average Downtime (min)
11/87	4	4	1.00
12/87	45	54	0.83
1/88	1	2	0.50
2/88	91	245	0.37
3/88	337	594	0.57
4/88	83	191	0.43
5/88	124	564	0.22
6/88	72	389	0.19
7/88	32	148	0.22
8/88	12	82	0.15
9/88	26	70	0.37
10/88	24	51	0.47
11/88	18	77	0.23
Total	869	2,471	0.35

TABLE 15. MONTHLY LKOT INTERLOCKS.

Month	Downtime (min)	Number of Interlocks	Average Downtime (min)
11/87	80	44	1.82
12/87	1443	634	2.28
1/88	398	629	0.63
2/88	808	323	2.50
3/88	253	247	1.02
4/88	537	437	1.23
5/88	177	198	0.89
6/88	51	90	0.57
7/88	277	230	1.20
8/88	217	149	1.46
9/88	254	148	1.72
10/88	5	1	5.00
11/88	2	15	0.13
Total	4502	3145	1.43

TABLE 16. MONTHLY LRT INTERLOCKS.

Month	Downtime (Min.)	Number of Interlocks	Average Downtime (Min.)
11/87	58	31	1.87
12/87	301	864	0.35
1/88	112	165	0.68
2/88	183	177	1.03
3/88	201	85	2.36
4/88	38	9	4.22
5/88	12	6	2.00
6/88	3	3	1.00
7/88	1	2	0.50
8/88	9	13	0.69
9/88	3	2	1.50
10/88	2	5	2.50
11/88	64	63	1.02
Total	987	1425	0.69

Scheduled maintenance accounted for a total of 1,521.55 hours of downtime for the 166 events reported. Table 17 is a list, by month, of the downtime incurred, the total number of events, along with the number of events that resulted in the feed auger being off, and the average duration of maintenance for both the total number of events and the events during which the auger was off. The feed auger was off for 1,485.46 hours (97.6%) of the scheduled maintenance time reported. The data from Table 17 is displayed in Figures 32 and 33. The data reported for September and November 1988 include not only maintenance time associated with soil processing, but also 77.7 hours in September and 110.5 hours early in November that are associated with burning of program-generated wood and trash.

Scheduled maintenance events were more frequent early in the program and less frequent starting in May 1988 (Figure 33). On the other hand, scheduled maintenance times started high, dropped, and then increased near the end of the program (Figure 32). Again, this trend resembles the bathtub curve. This may be attributable to system initial startup and wear phenomena; but it may be that maintenance time is inversely proportional to the number of scheduled maintenance events. Scheduled maintenance activities became less frequent mainly due to the changes in the operating parameters such as showing the rotation of the kiln and lowering the draft through the system. These changes resulted in scheduled outages every 59 days rather than every 30 days. While the decrease in scheduled outages may have contributed to an increase in maintenance problems in August and September 1988, the lack of a preventive maintenance program was the prime contributor to the maintenance problems.

(4) System Downtime

Scheduled maintenance accounted for 56.1% of the system downtime, unscheduled maintenance 29.1%, and interlocks 14.7%. This is depicted in Figure 34. Table 18 is a monthly list of the system unscheduled

TABLE 17. MONTHLY SCHEDULED MAINTENANCE.

Month	Total Maintenance Time (h)	Numbers of Events (total)	Average Maintenance Time (h)	Auger Downtime (h)	Number of Events (auger off)	Average Auger Downtime (h)
11/87	1.30	3	0.43	1.30	3	0.43
12/87	304.79	15	20.32	301.27	13	23.17
1/88	146.35	28	5.32	141.93	24	5.91
2/88	113.42	36	3.15	107.35	30	3.58
3/88	141.02	33	4.27	135.72	27	5.01
4/88	92.55	25	3.70	88.03	21	4.19
5/88	82.60	1	82.60	82.60	1	82.60
6/88	0.67	2	0.34	0.00	0	--
7/88	162.28	2	81.14	162.28	2	81.14
8/88	192.52	1	192.52	192.52	1	192.52
9/88	81.82[a]	9	9.09	77.90[a]	5	15.58
10/88	5.08	4	1.27	0.00	0	--
11/88	197.17[b]	7	28.17	194.50[b]	5	38.90
Total	1521.55	166	9.17	1485.46	132	11.25

a. Includes 77.7 h for burning trash

b. Includes 110.5 h for burning trash

TABLE 18. MONTHLY AUGER DOWNTIME.

Month	Unscheduled Maintenance (h)	Interlock Downtime (h)	Scheduled Maintenance (h)	Total Average (h)	Daily (h)
11/87	54.23	5.22	1.3	60.75	11.5
12/87	40.15	78.13	301.27	419.55	13.5
1/88	80.63	17.98	141.93	140.54	7.8
2/88	56.78	39.03	107.35	203.16	7.0
3/88	87.75	42.78	135.72	266.25	8.6
4/88	25.42	54.08	88.03	167.53	5.6
5/88	38.85	31.72	82.60	153.17	4.9
6/88	35.72	16.23	0.00	51.95	1.7
7/88	21.47	20.28	162.28	204.03	6.6
8/88	89.97	18.82	192.58	301.37	9.7
9/88	159.98	26.77	77.90	264.65	8.8
10/88	51.57	33.80	0.00	85.37	2.8
11/88	27.33	8.53	194.50	230.36	12.1
Total	769.85	393.37	1485.46	2648.68	7.3

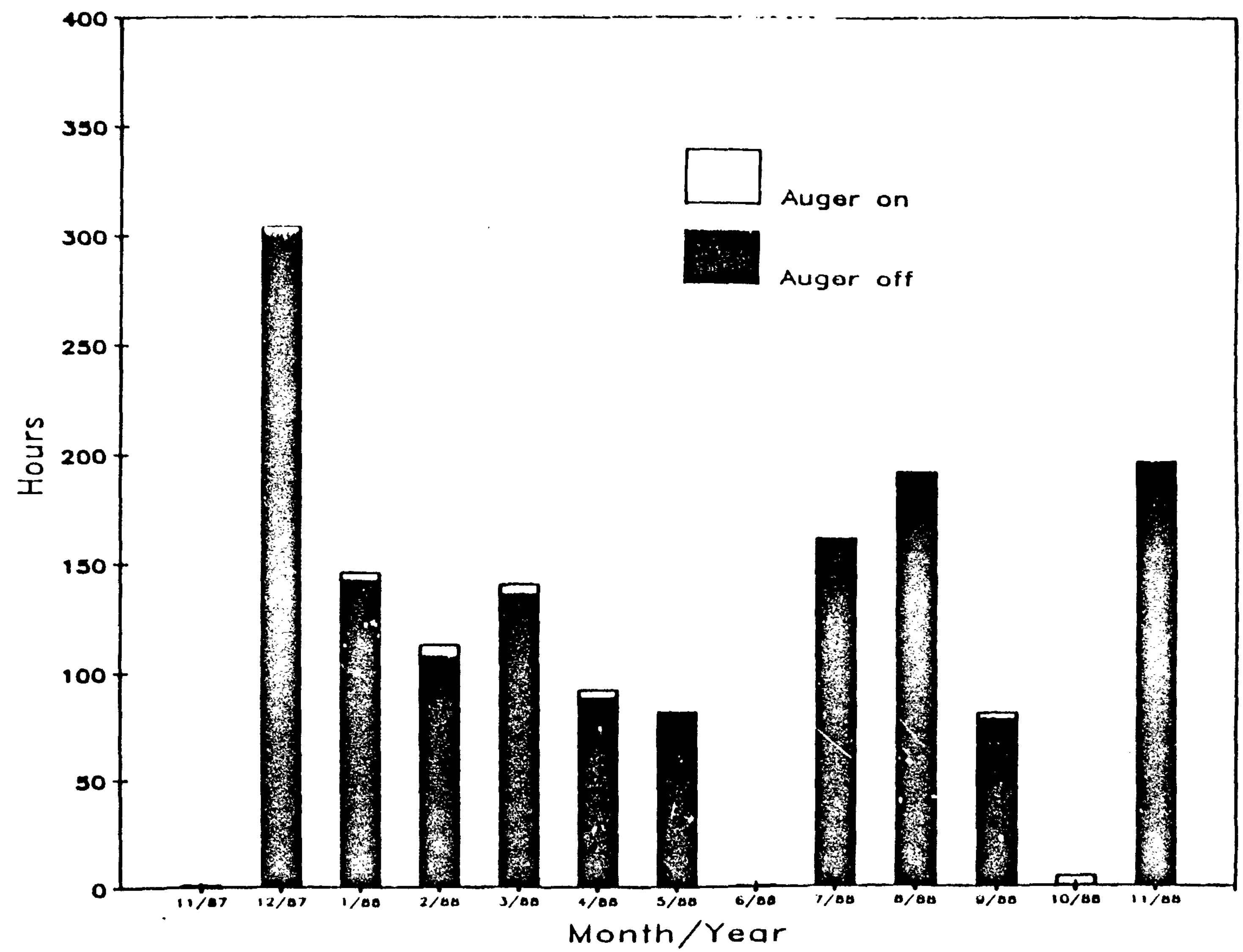

Figure 32. Monthly Scheduled Maintenance Times.

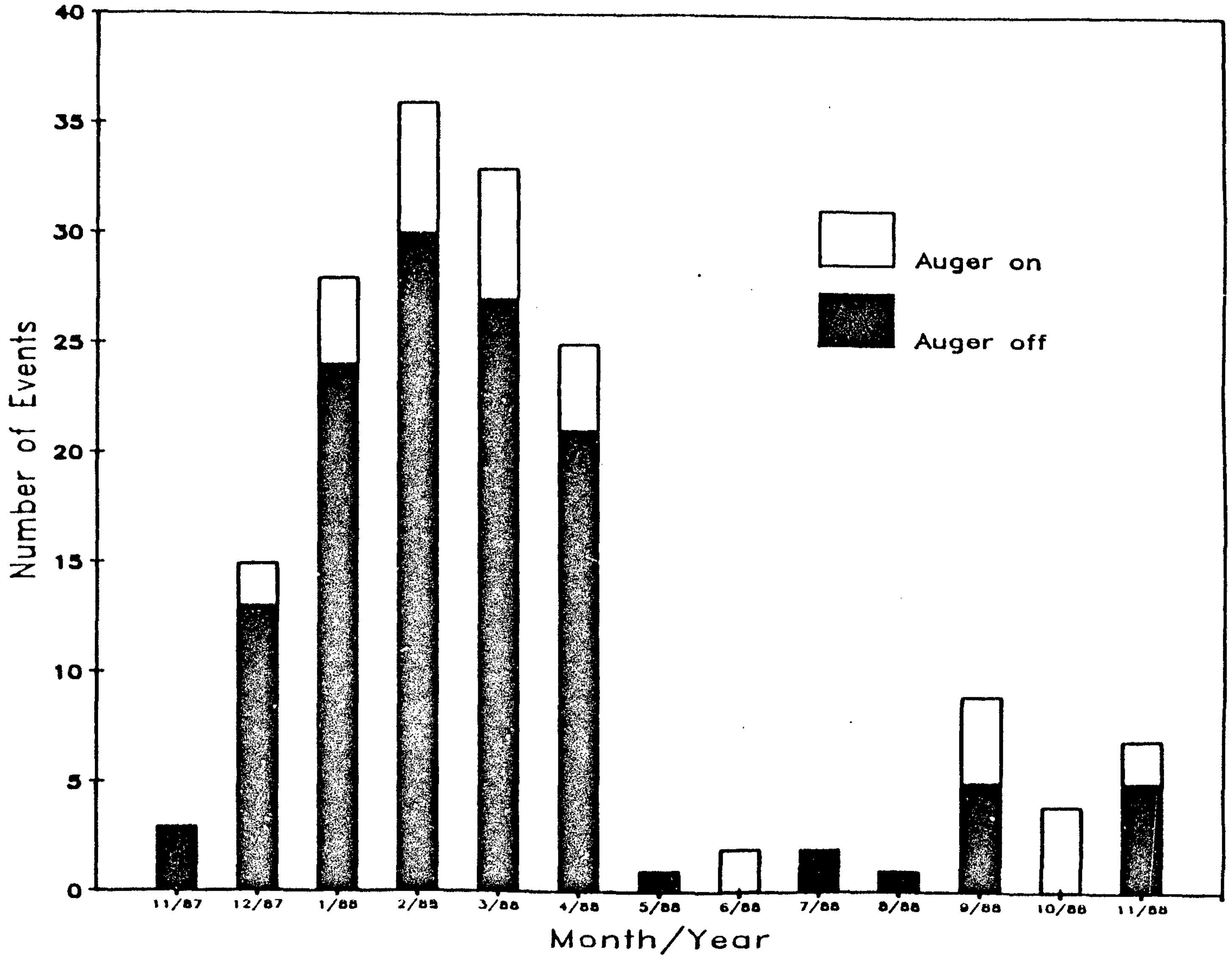

Figure 33. Monthly Scheduled Maintenance Events.

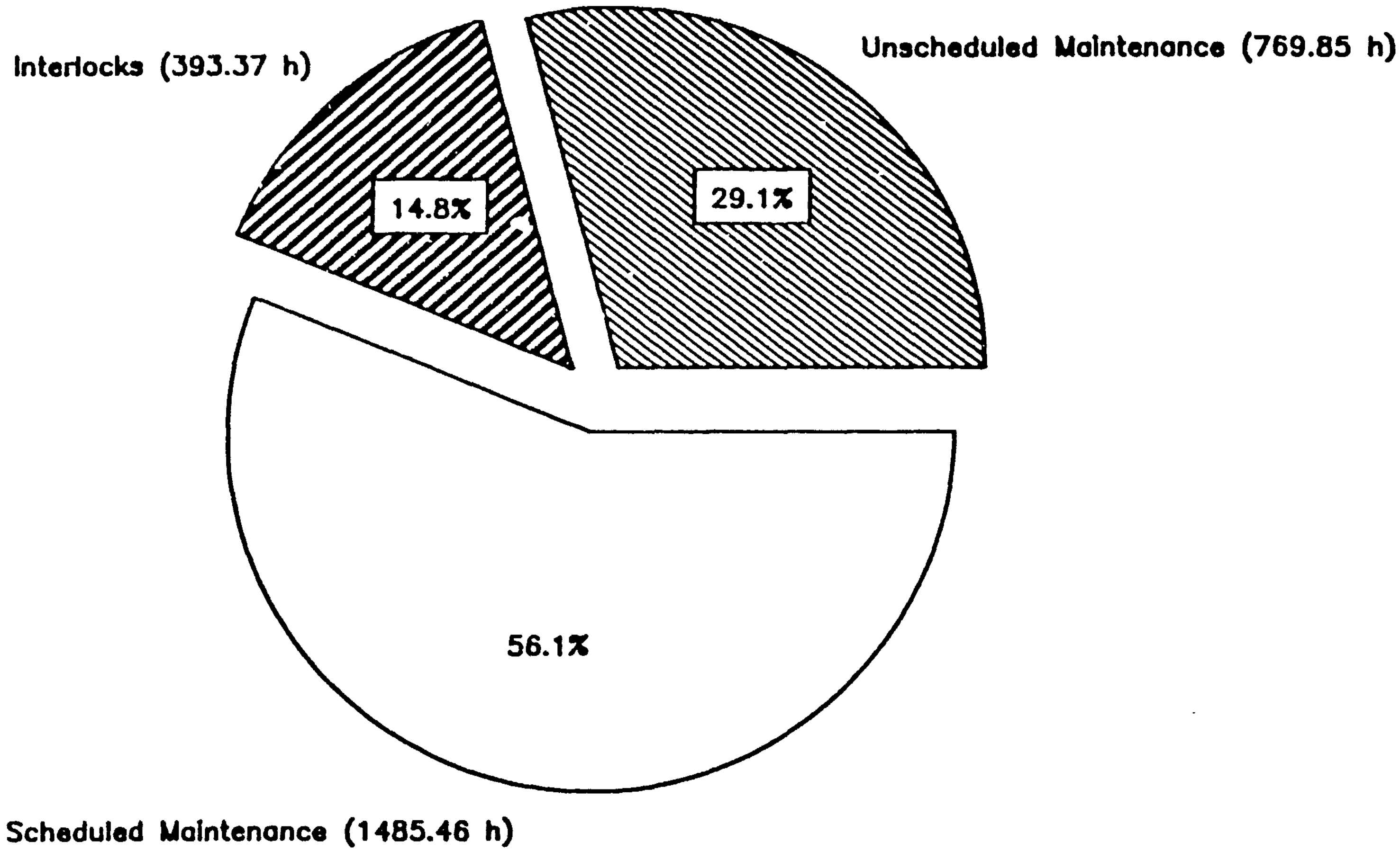

Figure 34. Comparison of Scheduled and Unscheduled Maintenance and Interlock Contributions to System Downtime.

and scheduled maintenance downtimes and the interlock downtimes, along with the average downtime per day of operation. The data show that the feed auger was shut down a total of 2,648 hours for all three of the system event types. The system was shut down an average of 7.3 hours per day. The monthly system downtime is shown in Figure 35.

b. Soil Processed

A total of 26,058.4 tons of soil was processed through the incinerator between November 25, 1987 and November 19, 1988. The monthly totals are shown in Table 19. Also listed are the on-line times for the auger, amount of soil processed, and average soil feed rates. The auger operated about 68% of the time with an average of about 72 tons of soil being processed each day.

Figure 36 is a plot of the amount of soil processed (tons) and Figure 37 displays the average feed rate in tons per hour based on total operating hours available for the month. The feed rate ranged from 1.5 tons/h to 4.4 tons/h, averaging 3.0 tons/h.

The monthly processing rate or feed rate based on auger on-line (available hours-downtime) time in hours is shown in Figure 38. Based on a normal distribution, this feed rate was statistically constant except during the first few days of operation in November 1987. An average of about 4.4 tons/h were fed into the incinerator during the soil incineration operating period.

Overall, the data showed that the tons of soil processed steadily increased from the start of the program (November 1987) until it reached a peak in June 1988. It then declined from June to September 1988. This is in agreement with observations made in the discussion of the data in the previous section. Namely, wear-out appeared to become important after June 1988. Also, soil processed in the latter part of the program was more troublesome because it contained a larger volume of materials (such as large rocks and metal) that were difficult to process. The soil processing increase in October 1988 (Figure 36) occurred after the new shredder was installed.

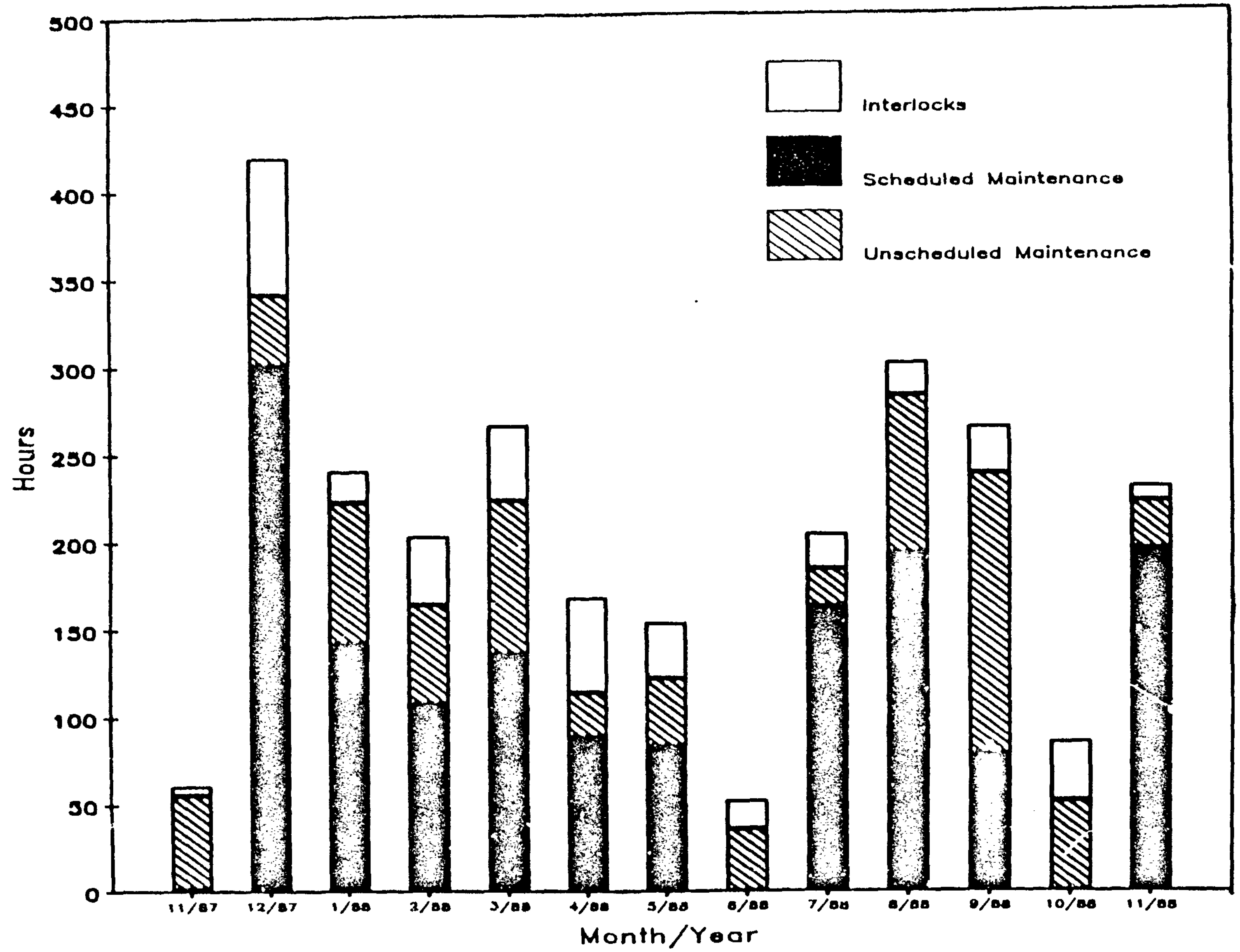

Figure 35. Monthly System Downtime.

TABLE 19. MONTHLY SOIL PROCESSED.

Month	Auger On-line (h)	Auger On-line (%)	Soil Processed (tons)	Average On-line Feedrate (tons/h)	Average Hourly Feedrate (tons/h)	Average Daily Feedrate (tons/d)
11/87	65.8	52.0	189.0	2.9	1.5	35.7
12/87	324.5	43.6	1440.6	4.4	1.9	46.5
1/88	498.6	67.0	1865.7	3.7	2.5	60.2
2/88	506.8	72.8	2081.9	4.1	3.0	71.8
3/88	495.3	66.6	2183.5	4.4	2.9	70.4
4/88	558.9	77.6	2563.9	4.6	3.6	85.5
5/88	588.8	79.1	2829.6	4.8	3.8	91.3
6/88	655.0	92.4	3178.8	4.8	4.4	106.0
7/88	535.3	72.0	2278.3	4.3	3.1	73.5
8/88	421.2	56.5	1935.2	4.6	2.6	62.4
9/88	357.7	49.7	1572.1	4.4	2.2	52.4
10/88	666.3	89.6	2987.7	4.5	4.0	96.4
11/88	207.7	45.5	952.3	4.6	2.1	50.1
Total	5891.9	68.1	26058.4	4.4	3.0	72.3

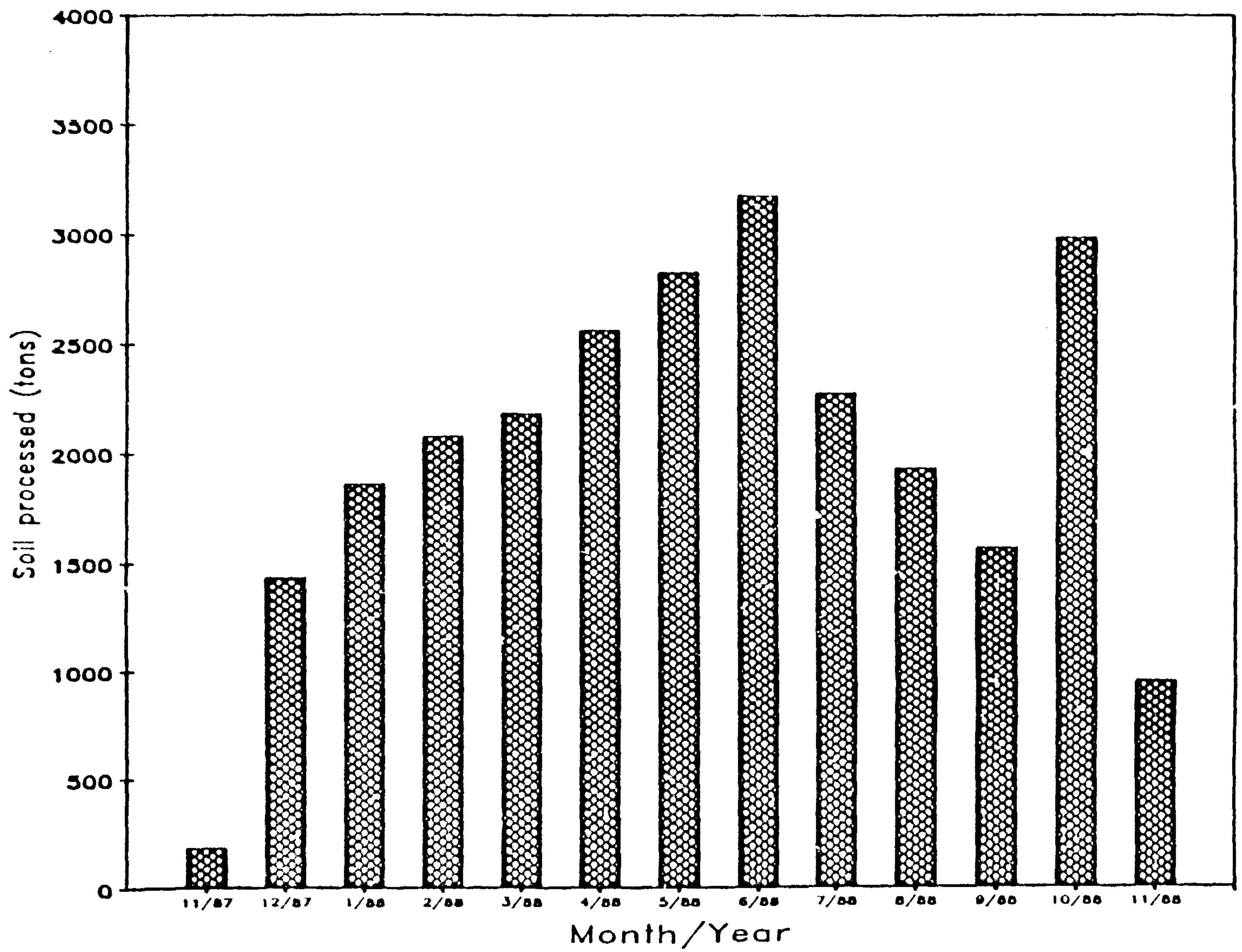

Figure 36. Monthly Soil Processed.

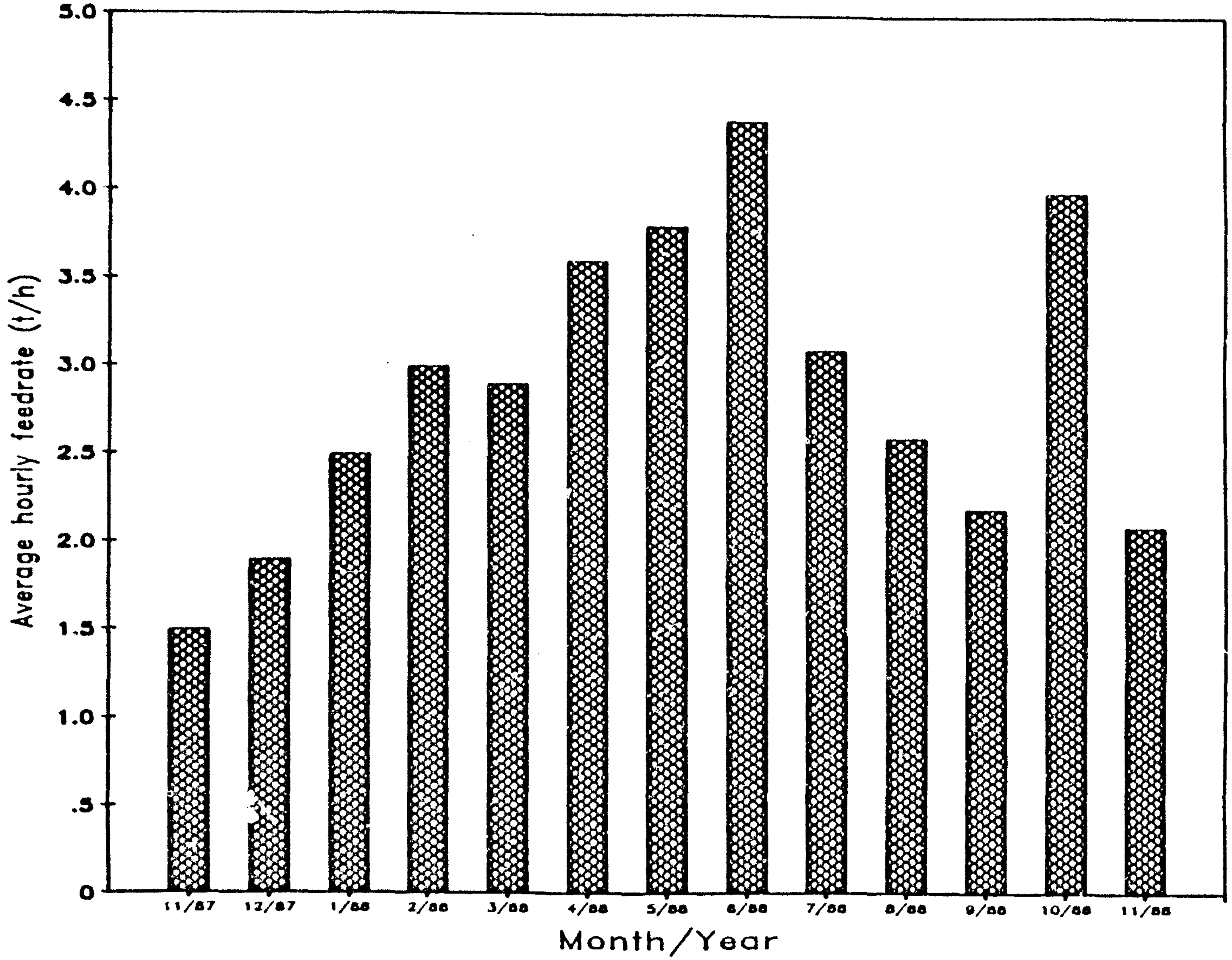

Figure 37. Monthly Average Feed Rate.

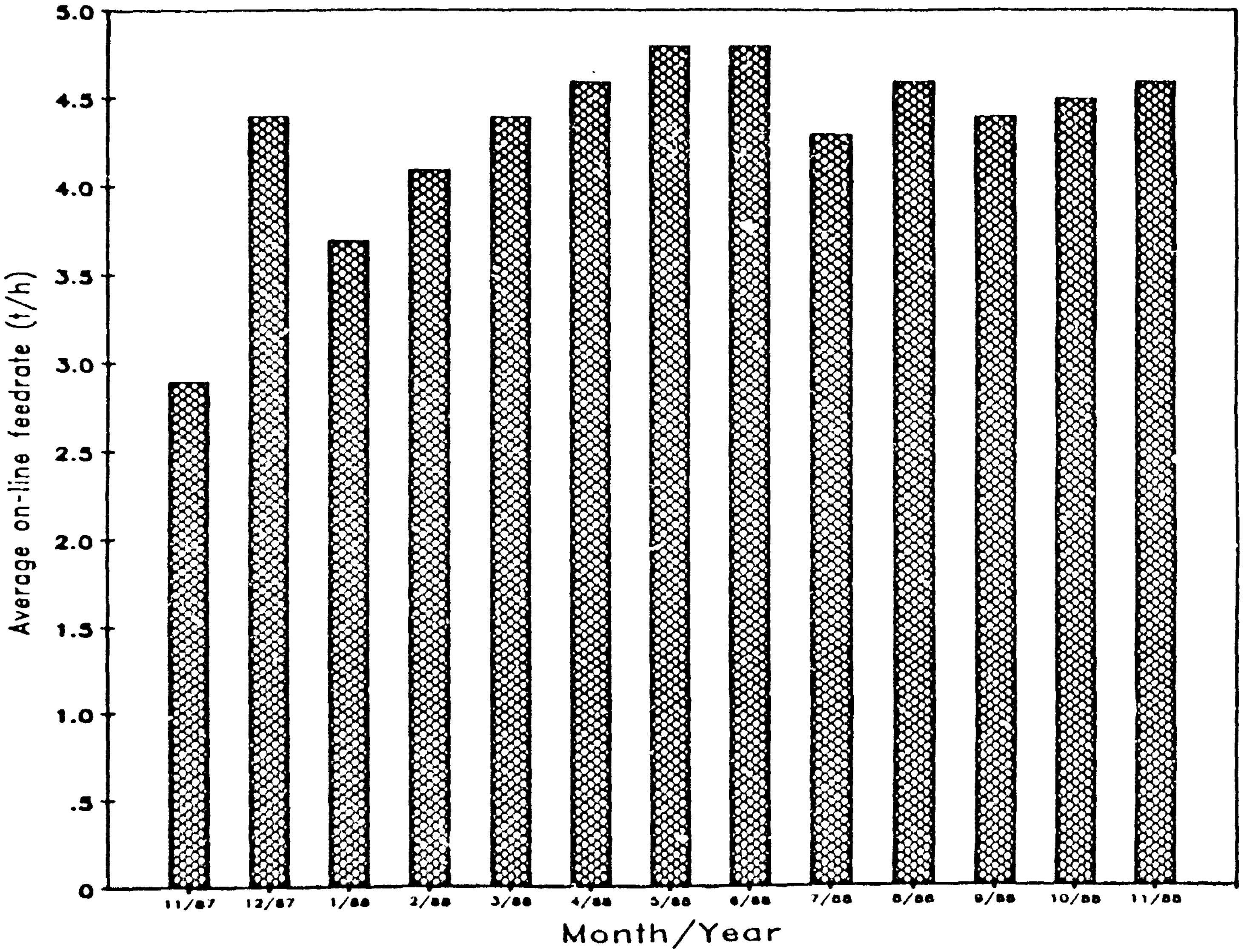

Figure 38. Monthly Average Processing Rate.

Production in April, May, and June 1988 increased dramatically because ENSCO was trying to set new production records. The motivation to increase production was due to a modification of the ENSCO contract. Basically, the contract change called for a higher fee for higher production. The quantity of soil processed in June 1988 was particularly high as ENSCO delayed needed maintenance on the incinerator until after the higher production goal was reached.

As shown on Figure 36 (also Table 19), production started to decrease in July 1988. This decrease is attributed to: (1) problems with the shredder (plugging and hydraulics), (2) problems with the ash drag bearings, drive chain, and drag flights, and (3) the average feed ratio/h was reduced (maximum of 3 tons/h) for several days while waiting for approval of an EPA permit extension concerning an increase in the quantity of soil that could be processed. The reduction in feed rate allowed us to continue to operate while waiting for EPA approval on the permit extension. Continuing to operate at the normal 5 tons/h may have meant that we would reach the existing permit soil quantity level and would have had to shut the operation down. Production continued to decrease in August 1988 (Figure 36, Table 19). This decrease in production was caused by the following: (1) shredder hydraulic and motor seals problems, (2) ash drag drive chain, (3) lost production time caused by a Hurricane Condition III Alert, and (4) repositioning of the weigh hopper/shredder/conveyor system to excavate contaminated plots. This repositioning of the weigh hopper/shredder/conveyor system took 8 days, during which time production was halted. On August 29, 1988, the shredder motor and seals failed, halting production again. Production did not resume until September 2, 1988.

EG&G Idaho and ENSCO personnel decided to use the new shredder to shred large rocks stockpiled near the incinerator. Erroneous high average feed rate (HAFR) interlocks and several broken side panels resulted from the large rocks bouncing around inside the weigh hopper. Other problems that plagued the incinerator during September were: (1) ash drag bearings, (2) the loss of several rows of refractory brick from the kiln, (3) conveyor belt wear, and (4) the last original hollow trunnion broke.

Processing of ordinary soil (versus large rocks) and 90% incinerator on-line time resulted in October being a high production month.

c. Costs

The monthly cost of incinerator operations during the period from December 1987 through November 1988 ranged from $7,094 (November 1988) to $10,824 (February 1988) per day. Detailed monthly costs are shown in Table 20. These costs are for incinerator operations only. A plot of the same information is shown in Figure 39. The large materials cost in February may be due to a time lag in vendors invoicing ENSCO, and in turn ENSCO invoicing EG&G Idaho. Evaluation of cost data was limited to the major component repair or replacement parts costs as listed in Table 21. The parts costs, excluding the final repair of the incinerator at the ENSCO facilities in White Bluff, Tennessee, amounted to $169,878. Nearly 70% of these costs were for the shredder (02) and kiln (05). Most of these costs were incurred in March, July, and September. During March, the shredder teeth were changed and the kiln refractory was repaired and seals replaced. During July, the shredder teeth bearings, seals, lock nuts, end caps, and spacers were replaced. The largest parts cost of $60,000 (35% of the major parts costs) was incurred in September for replacement of the shredder.

Upon shipment of the incinerator to ENSCO facilities at White Bluff, Tennessee, it was given a thorough examination for wear by ENSCO personnel. This examination showed the incinerator to be in better condition than was originally anticipated when it left the NCBC. The only major items in need of repair were the ash drag and the kiln seals, which were completely worn out. The ash dr is discussed further in Section VI.A.3.

The list of parts required to make the repairs at White Bluff, Tennessee are shown in Table 22. The parts cost for these repairs were $13,132.

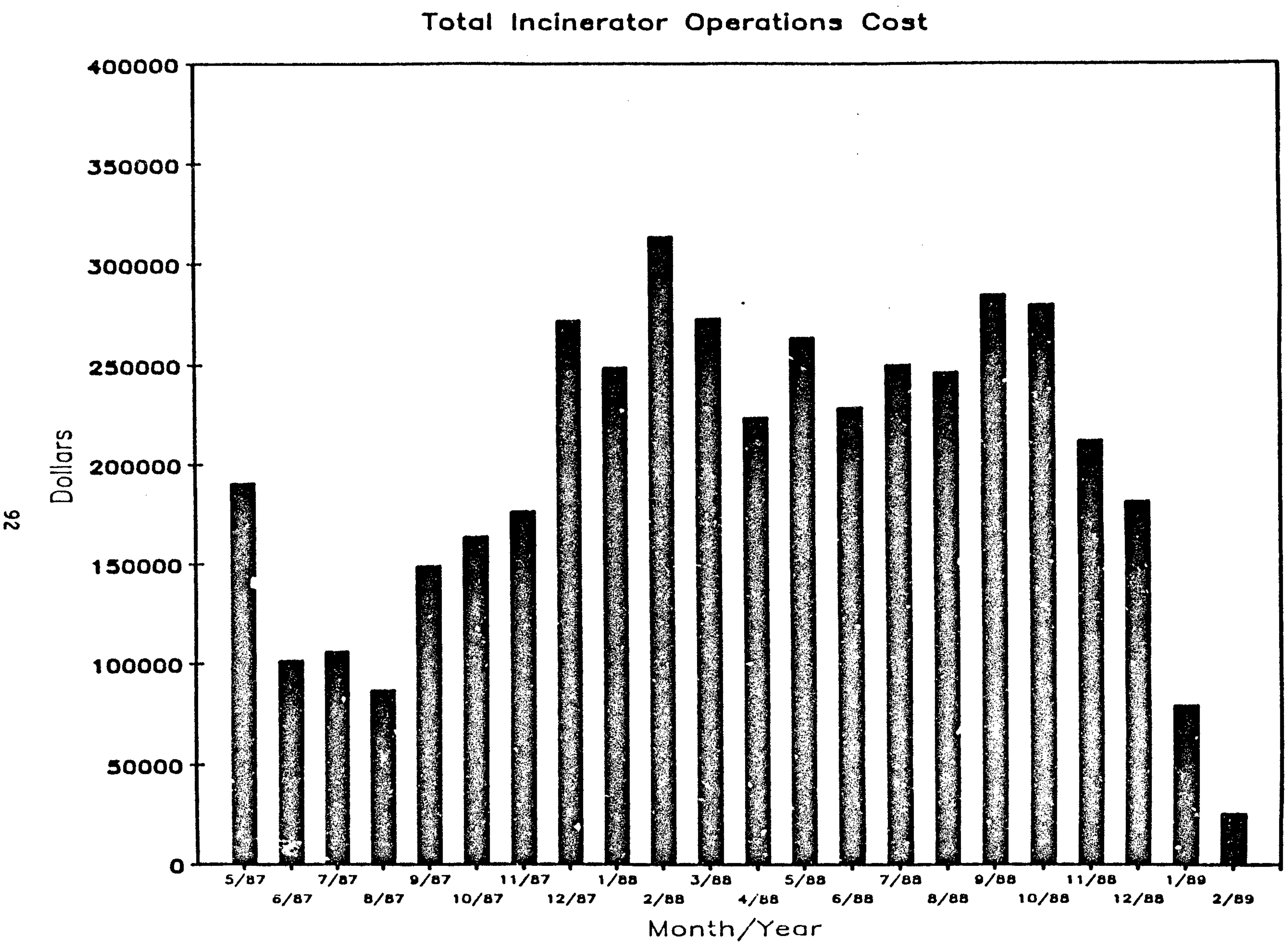

Figure 39. Graph of Operations Monthly Cost.

TABLE 20. INCINERATOR OPERATIONS SPREAD SHEET

NCBC INCINERATION PROJECT
INCINERATOR OPERATIONS
MAY 1987 THROUGH FEBRUARY 1989

MONTHLY MONETARY TOTALS		MAY 87 $191,169.31	JUNE 87 $102,017.69	JULY 87 $106,564.48	AUG 87 $87,299.00
ITEM EXPENDITURES	UNIT TOTALS				
INCINERATOR LEASE	$1,501,632.50	87,299.00	87,299.00	87,299.00	87,299.00
ABC RENTAL	$7,268.86	1,442.00	46.00		
HERTZ RENTAL	$37,153.54	6,163.00			
LABOR	$1,018,804.00	62,111.00			
NATURAL GAS	$974,144.52	18,780.84	12,978.90	18,946.24	
WATER	$14,749.02	1,959.85	1,375.13		
SEWAGE	$3,392.93				
ELECTRICITY	$87,447.49	306.12	318.66	319.24	
FRONT END LOADER	$83,936.62				
FORKLIFT	$26,673.94				
MATERIALS	$612,205.86	13,107.50			

TABLE 20. INCINERATOR OPERATIONS SPREAD SHEET (CONTINUED)

NCBC INCINERATION PROJECT
INCINERATOR OPERATIONS
MAY 1987 THROUGH FEBRUARY 1989

MONTHLY MONETARY TOTALS		SEPT 87 $149,524.98	OCT 87 $164,294.68	NOV 87 $176,943.55	DEC 87 $272,582.63
ITEM EXPENDITURES	: UNIT TOTALS :				
INCINERATOR LEASE	:$1,501,632.50 :	87,299.00	87,299.00	87,299.00	87,299.00
ABC RENTAL	: $7,268.86 :		187.62		612.00
HERTZ RENTAL	: $37,153.54 :		1,496.00	2,793.10	6,005.00
LABOR	:$1,018,804.00 :	46,645.00	52,093.00	71,529.00	65,879.00
NATURAL GAS	: $974,144.52 :		3,322.50		84,825.64
WATER	: $14,749.02 :		33.25	2.85	813.20
SEWAGE	: $3,392.93 :		19.95	1.42	487.82
ELECTRICITY	: $87,447.49 :		269.09	289.65	2,794.22
FRONT END LOADER	: $83,936.62 :	945.00	2,597.00		4,717.00
FORKLIFT	: $26,673.94 :	1,500.00	581.94	2,120.00	2,720.00
MATERIALS	: $612,205.86 :	13,135.98	16,395.33	12,908.53	16,429.75

TABLE 20. INCINERATOR OPERATIONS SPREAD SHEET (CONTINUED)

NCBC INCINERATION PROJECT
INCINERATOR OPERATIONS
MAY 1987 THROUGH FEBRUARY 1989

MONTHLY MONETARY TOTALS		JAN 88 $249,208.53	FEB 88 $313,908.84	MAR 88 $273,385.15	APRIL 88 $224,029.36
ITEM EXPENDITURES	: UNIT TOTALS :				
INCINERATOR LEASE	:$1,501,632.50 :	60,371.00	59,371.00	61,549.00	61,549.00
ABC RENTAL	: $7,268.86 :		137.38	45.58	292.56
HERTZ RENTAL	: $37,153.54 :	2,968.00	7,935.11	2,666.10	5,510.62
LABOR	:$1,018,804.00 :	77,170.00	63,484.00	61,927.00	47,054.00
NATURAL GAS	: $974,144.52 :	67,129.00	75,606.00	83,199.83	61,705.83
WATER	: $14,749.02 :	635.00	766.00	846.93	901.08
SEWAGE	: $3,392.93 :	380.00	459.00	507.78	540.55
ELECTRICITY	: $87,447.49 :	5,282.22	5,946.81	4,852.51	6,037.24
FRONT END LOADER	: $83,936.62 :	2,597.00	2,597.00	2,597.00	5,247.00
FORKLIFT	: $26,673.94 :	2,150.00	2,905.00	2,507.00	1,097.10
MATERIALS	: $612,205.86 :	30,526.31	94,731.54	52,686.42	34,094.38

TABLE 20. INCINERATOR OPERATIONS SPREAD SHEET (CONTINUED)

NCBC INCINERATION PROJECT
INCINERATOR OPERATIONS
MAY 1987 THROUGH FEBRUARY 1989

MONTHLY MONETARY TOTALS		MAY 88 $263,942.83	JUNE 88 $228,984.28	JULY 88 $250,497.81	AUG 88 $246,783.09
ITEM EXPENDITURES	: UNIT TOTALS :				
INCINERATOR LEASE	:$1,501,632.50 :	61,549.00	61,549.00	61,549.00	61,549.00
ABC RENTAL	: $7,268.86 :	199.02			405.88
HERTZ RENTAL	: $37,153.54 :		568.88		
LABOR	:$1,018,804.00 :	78,821.00	51,369.00	70,039.00	62,723.00
NATURAL GAS	: $974,144.52 :	65,959.08	73,595.67	68,267.10	63,663.57
WATER	: $14,749.02 :	1,149.03	1,241.18	1,073.98	795.63
SEWAGE	: $3,392.93 :				
ELECTRICITY	: $87,447.49 :	5,761.73	6.995.37	7,138.87	8,124.63
FRONT END LOADER	: $83,936.62 :	5,247.00	[illegible],247.00	5,247.00	5,247.00
FORKLIFT	: $26,673.94 :	1,097.10	1,219.00	1,097.10	1,097.10
MATERIALS	: $612,205.86 :	44,159.87	27,299.18	36,065.76	43,177.28

TABLE 20. INCINERATOR OPERATIONS SPREAD SHEET (CONTINUED)

NCBC INCINERATION PROJECT
INCINERATOR OPERATIONS
MAY 1987 THROUGH FEBRUARY 1989

MONTHLY MONETARY TOTALS		SEPT 88 $285,207.06	OCT 88 $280,452.19	NOV 88 $212,813.27	DEC 88 $182,171.88
ITEM EXPENDITURES	: UNIT TOTALS :				
INCINERATOR LEASE	:$1,501,632.50 :	59,882.00	59,882.00	59,882.00	59,882.00
ABC RENTAL	: $7,268.86 :	906.57	638.63	621.35	1,196.16
HERTZ RENTAL	: $37,153.54 :				
LABOR	:$1,018,804.00 :	59,490.00	75,307.00	57,917.00	15,246.00
NATURAL GAS	: $974,144.52 :	61,589.79	82,441.98	56,925.[illegible]	75,206.92
WATER	: $14,749.02 :	702.05	944.30	646.00	722.48
SEWAGE	: $3,392.93 :				
ELECTRICITY	: $87,447.49 :	6,240.81	6,803.02	7,469.37	6,576.40
FRONT END LOADER	: $83,936.62 :	5,247.00	11,937.46	8,586.00	8,586.00
FORKLIFT	: $26,673.94 :	1,097.10	1,097.10	1,097.10	1,097.10
MATERIALS	: $612,205.86 :	90,051.74	41,406.70	19,668.82	13,658.82

TABLE 20. INCINERATOR OPERATIONS SPREAD SHEET (CONCLUDED)

NCBC INCINERATION PROJECT
INCINERATOR OPERATIONS
MAY 1987 THROUGH FEBRUARY 1989

MONTHLY MONETARY TOTALS		JAN 89 $79,369.11	FEB 89 $25,653.56
ITEM EXPENDITURES	: UNIT TOTALS :		
INCINERATOR LEASE	:$1,501,632.50 :	59,882.00	14,794.50
ABC RENTAL	: $7,268.86 :	319.06	249.05
HERTZ RENTAL	: $37,153.54 :		1,047.73
LABOR	:$1,018,804.00 :		
NATURAL GAS	: $974,144.52 :		
WATER	: $14,749.02 :	141.08	
SEWAGE	: $3,392.93 :		996.41
ELECTRICITY	: $87,447.49 :	5,244.44	777.09
FRONT END LOADER	: $83,936.62 :	3,339.00	3,956.15
FORKLIFT	: $26,673.94 :	1,097.10	1,097.10
MATERIALS	: $612,205.86 :	9,946.43	2,735.52

TABLE 21. MAJOR COMPONENT PARTS COST.

	Major Component	Cost ($)
Miscellaneous	--	900
Weigh Hopper	(01)	3,075
Shredder	(02)	91,798
Conveyor	(03)	352
Feed Hopper	(04)	8,634
Kiln	(05)	25,026
Ash Drag	(06)	1,305
Cyclones	(07)	0
Secondary Combustion Chamber	(08)	9,993
Divert Tee	(09)	0
Boiler	(10)	3,628
Deaerator	(11)	0
Boiler Outlet	(12)	0
Quench Elbow	(13)	392
ENT/Quench Tank	(14)	779
Cross-Over Duct	(15)	0
Packed Tower	(16)	2,250
Scrubber Jet	(17)	0
Scrubber Pump	(18)	2,154
Demister	(19)	8,496
Stack	(20)	0
Instrumentation	(21)	6,170
Settling Tank	(22)	825
Raw Water System	(23)	1,012
POTW	(24)	2,395
Cameras	(25)	250
Treated Water	(26)	0
Desilicizer	(27)	444
Total		169,878

TABLE 22. PARTS LIST FOR FINAL EQUIPMENT REPAIR.

<u>Scrubber System</u>

Scrubber Pumps 1 and 2
- Seal #RAE74-V
- 1-1/2" Ball check valve CPVC
- 1-1/4" Ball check valve CPVC
- 1" Ball valve CPVC
- 3/4" Ball valve CPVC
- 2" Ball valve CPVC
- PSI Gage 0-300
- 1/2" Con. bowl water trap
- Scrubber nozzle
- Scrubber sight glass

<u>ENT System</u>

ENT Pumps 1 and 2
- Seals E75-VV dulb.
- Woods max rpm 7600
- Rear cover, item 106
- Flex housing #55C35

<u>Treated Water System</u>

Treated Water Pumps
- Flex coup. pat. #2867 102
- Impeller size 1.5XF-6/60
- 2" Cast strainer

<u>Boiler Trailer</u>

Boiler Pumps
- Complete rebuilt pump #2
- Seal 12.5B, 13B, and 14B
- Seal cup #2B
- Flinger #21B
- 12.5B Stationary
- 13.B Drive collar
- 14.B Rotating elem.
- 1-1/2" Gate valve long stem
- 1-1/2" Steam valve
- 3" Brass gate valve

TABLE 22. PARTS LIST FOR FINAL EQUIPMENT REPAIR (CONCLUDED).

<u>Kiln Trailer</u>
Webbco flex-steel seals, 3 modules each set complete for 80" diameter sealing surface
<u>Ash Conveyor Assembly</u>
Flights (53 Req'd)
Drag chain
Sprockets - 6 tooth for tank (2 required)
Sprockets - 8 tooth for tank (2 required)
Drive sprocket and chain
Structure
<u>Packed Tower Assembly</u>
4" (CPVC) Basket strainer (Hayward)
4" (CPVC) flange #80
2" (CPVC) Ball valve
4 x 8 Sheet plexiglass

2. Specific Components

This section discusses the items that contributed to the availability of the incinerator. Most of these were corrected at some time during the project while others need corrective action for future projects.

a. Packed Tower Tellerettes

No operational damage to the tellerettes occurred during the project. These can be damaged if the packed tower temperatures are allowed to get too high. The tellerettes were usually changed during the scheduled outage. The only damage to them occurred during the handling process. A noticeable change to the tellerettes was their brittleness caused by the sustained exposure to 160°F or higher temperatures. Figure 40 shows the tellerettes upon removal from the packed tower and Figure 41 shows the tellerettes after cleaning. The cleaning consisted of soaking the tellerettes in water for a period of time and then knocking the particulates from them.

b. Shredder Inspection

The original condition of the shredder is shown in Figure 42. The inspection of the shredder showed a great deal of wear to the teeth and wipers on the right side of the shredder. The third wiper on the right is bent towards the back of the shredder into the space for the second wiper (Figure 43). Several wipers are worn to a thin razor's edge (Figure 44). Wiper 17 is missing, apparently having broken off at the weld (Figure 45).

The size of the teeth on the right side were noticeably smaller than those on the left. The teeth on the right are 0.6 inches wide, those on the left are 0.75 inches. The teeth were originally one inch wide.

On the radius, the right front teeth were worn by 1.5 inches, whereas those on the left and in the middle of the shredder had worn radially by approximately 0.5 inches.

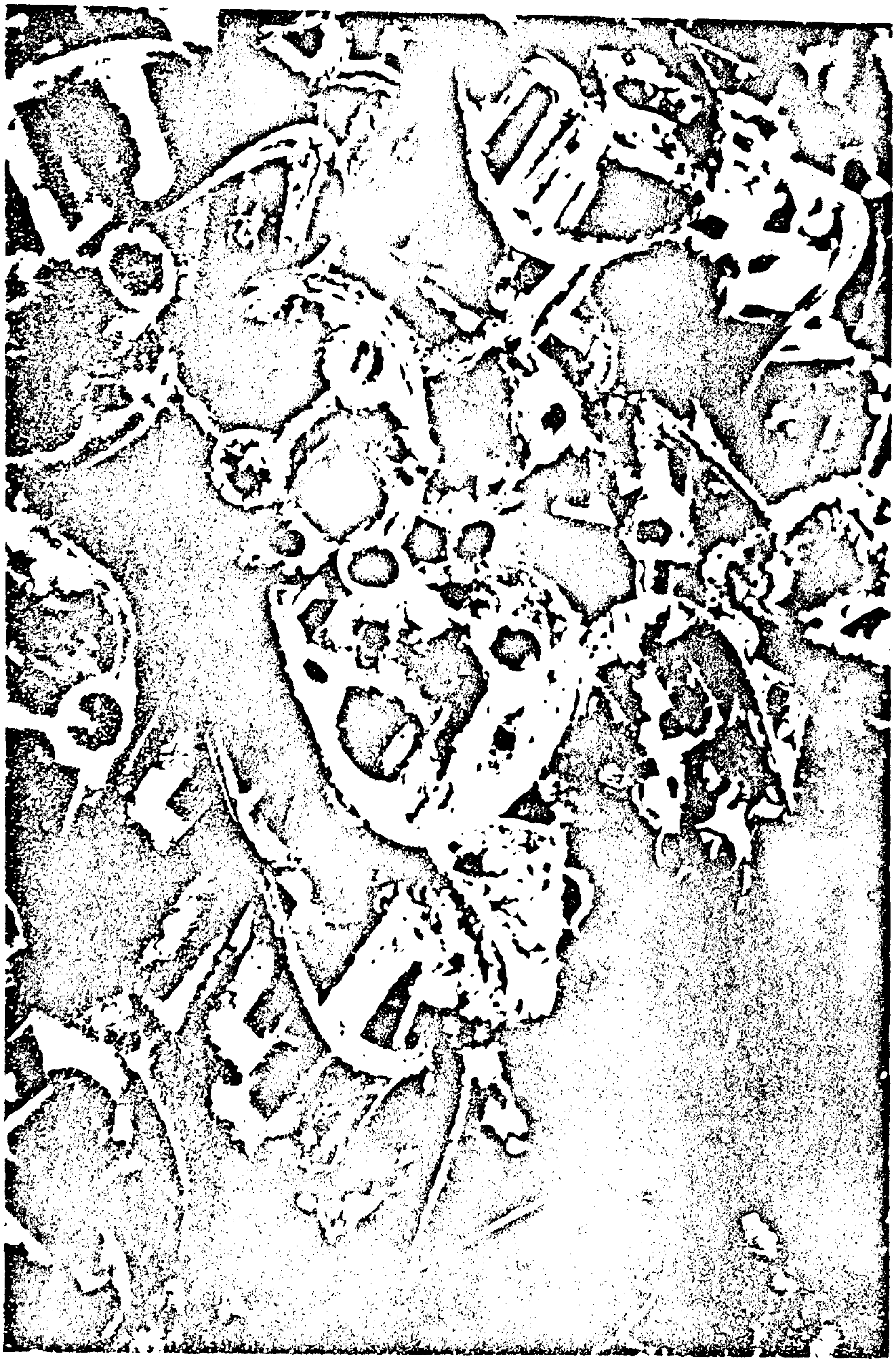

Figure 40. Packed Tower Tellerettes Before Cleaning.

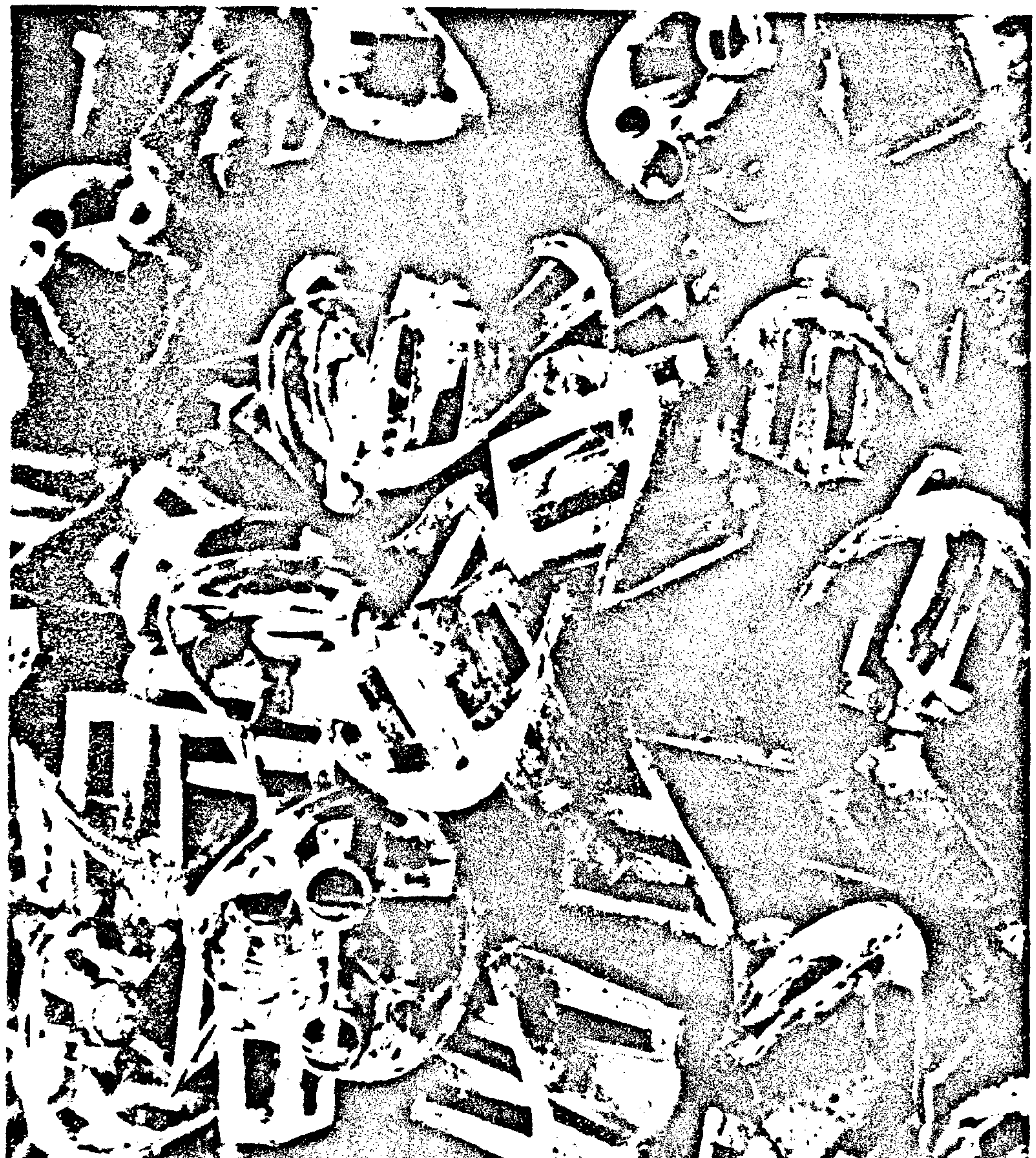

Figure 41. Packed Tower Tellerettes After Cleaning.

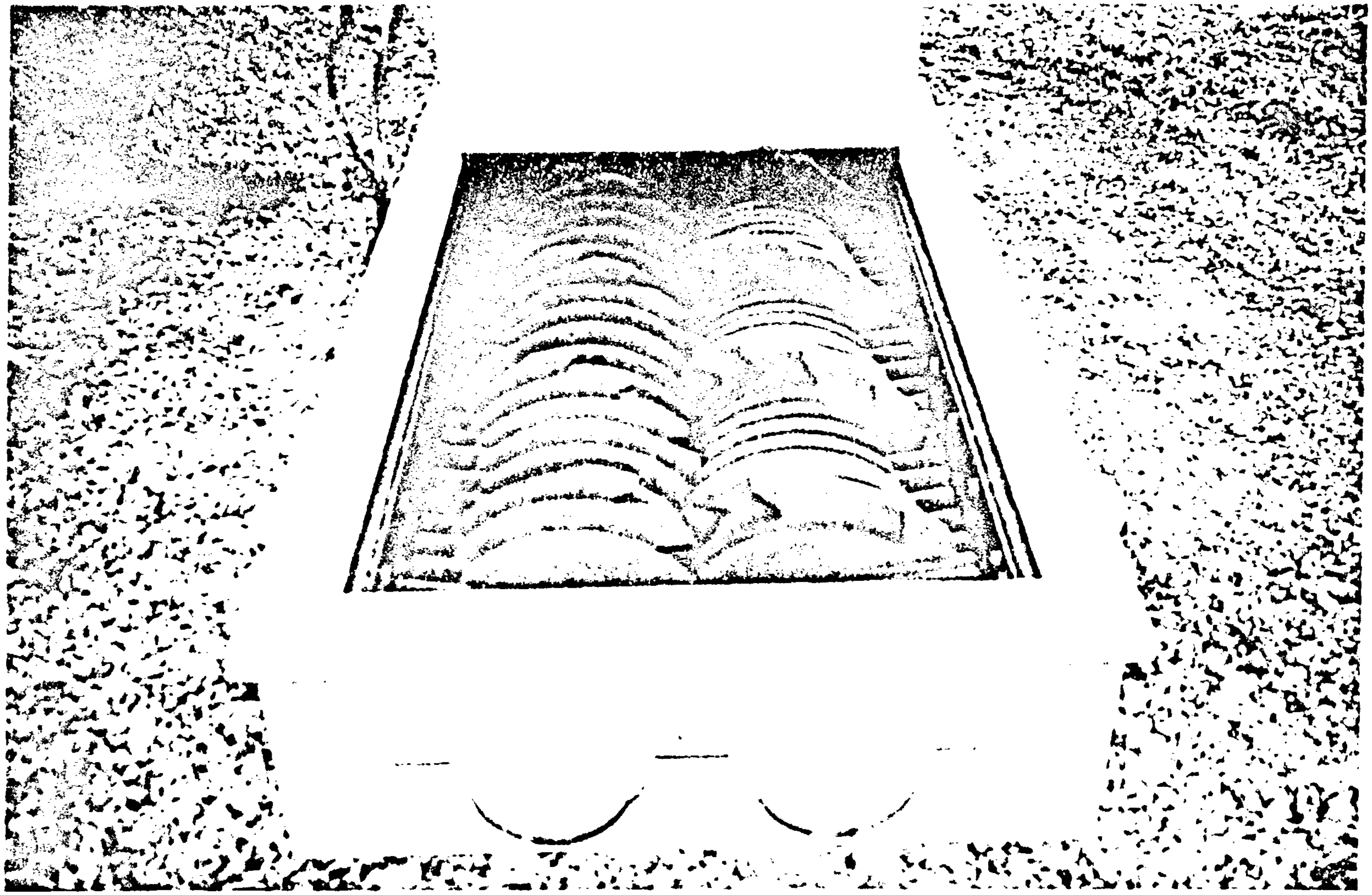

Figure 42. Shredder as Received.

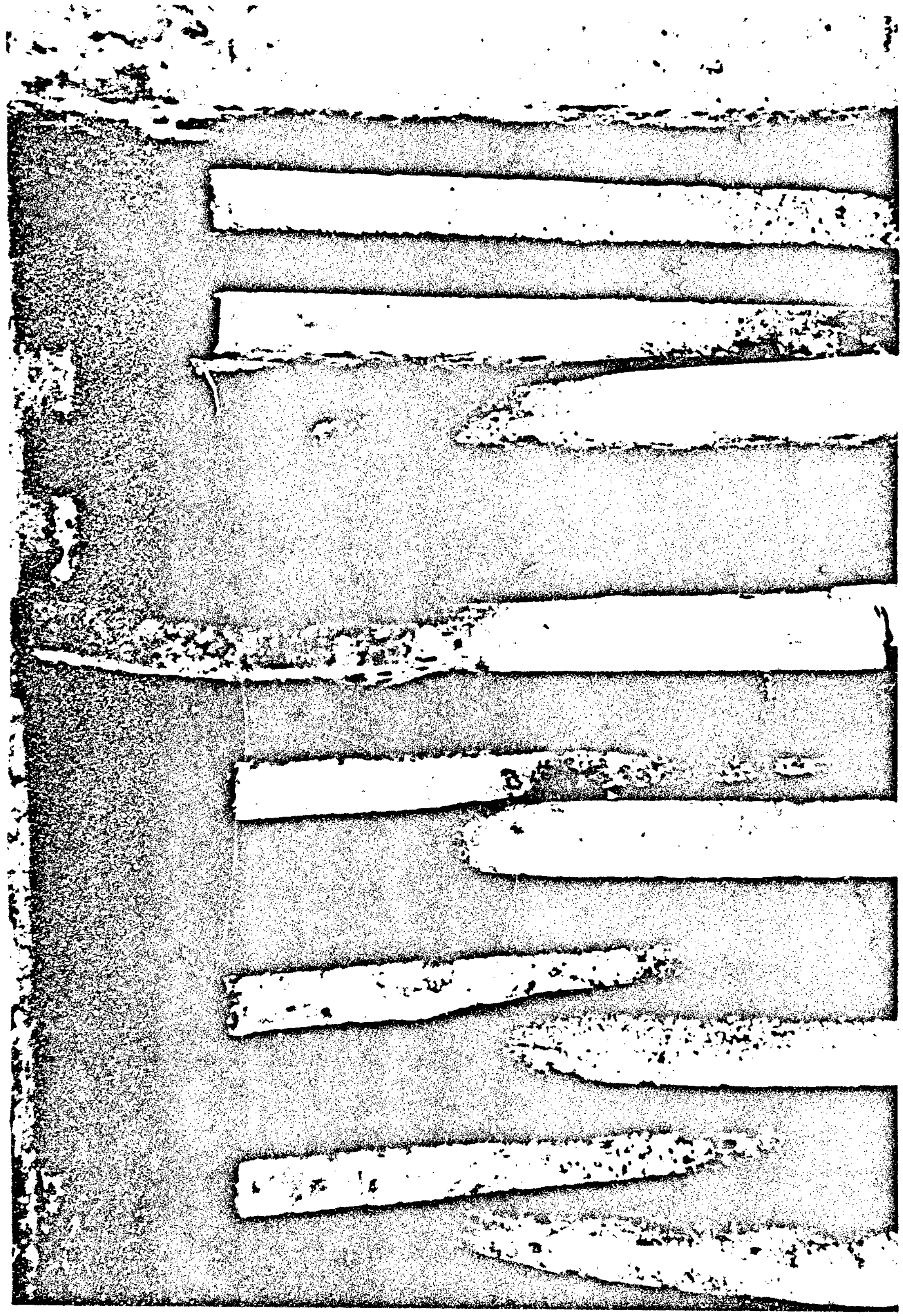

Figure 43. Bent Wiper on Shredder.

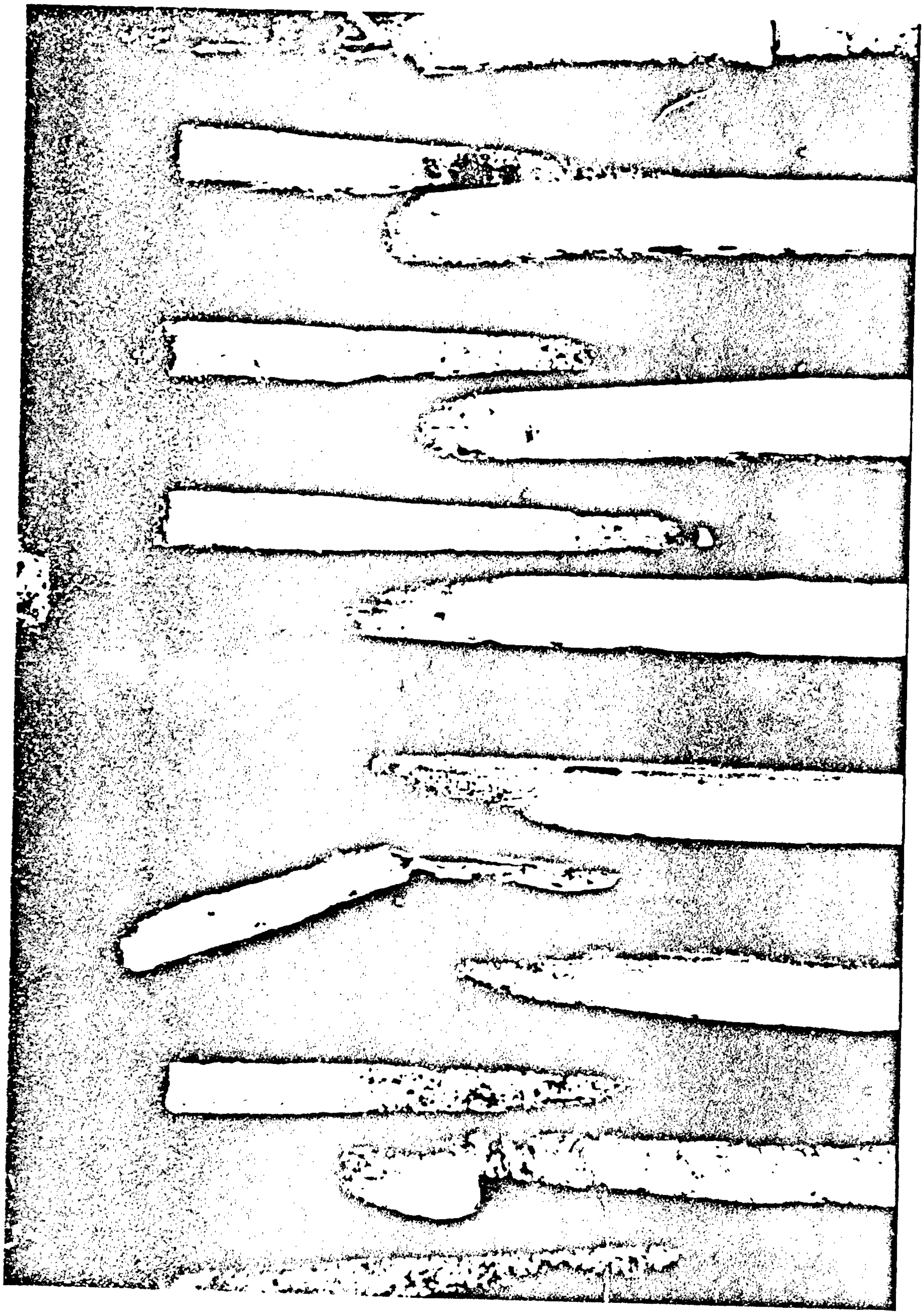

Figure 44. General Wear on Shredder.

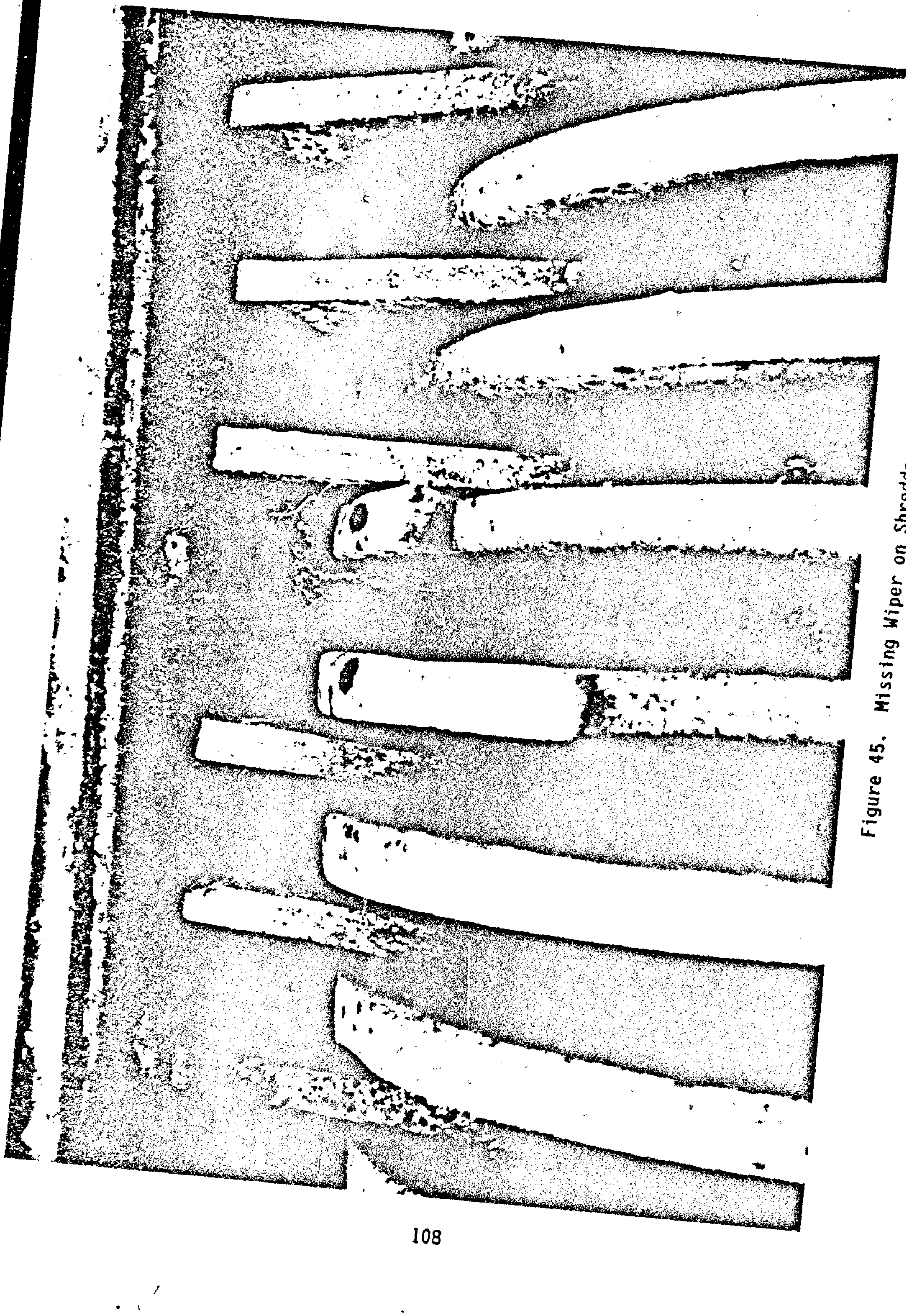

Figure 45. Missing Wiper on Shredder.

The difference in wear between the right and left side is attributed to the right side shaft turning about twice as fast as the left shaft. This difference in shaft speed provides a tearing as well as a shearing action. The observed wear is considered to be normal for this type of operation. An overall view of the shredder in the used condition is shown in Figure 46. The teeth in back appear virtually untouched.

c. Ash Drag Inspection

The inspection of the ash drag identified considerable wear on several parts of the system:

(1) Drag Flights

The drag flights had an excessive amount of wear on the ends of the flight. This can be seen in Figure 47. Some of the flights show wear on both ends and both sides. This indicates that the flight was turned over to use the second side. This is shown in Figure 48.

The side arms of the drag flights where the drag chain king pins slip through the bushings also show considerable wear. Not only are the bushing areas worn down from the metal to metal drag, but several of the brass bushing are missing, and the drag chain king pins are worn down to the cotter pin holes. This area is shown in Figure 49, Figure 50, and Figure 51.

(2) Drag Chute

Although not noticeable in photographs, the bottom of the chute was worn thin enough that it had to be patched several times to prevent leaks. The chain guides on each side had grooves worn in them that matched the shape of a drag flight. These grooves are shown in Figure 52. The original chain guides were made from a mild steel. After wearing out the original guides, a 5/8-inch thick, AR-400 plate was used.

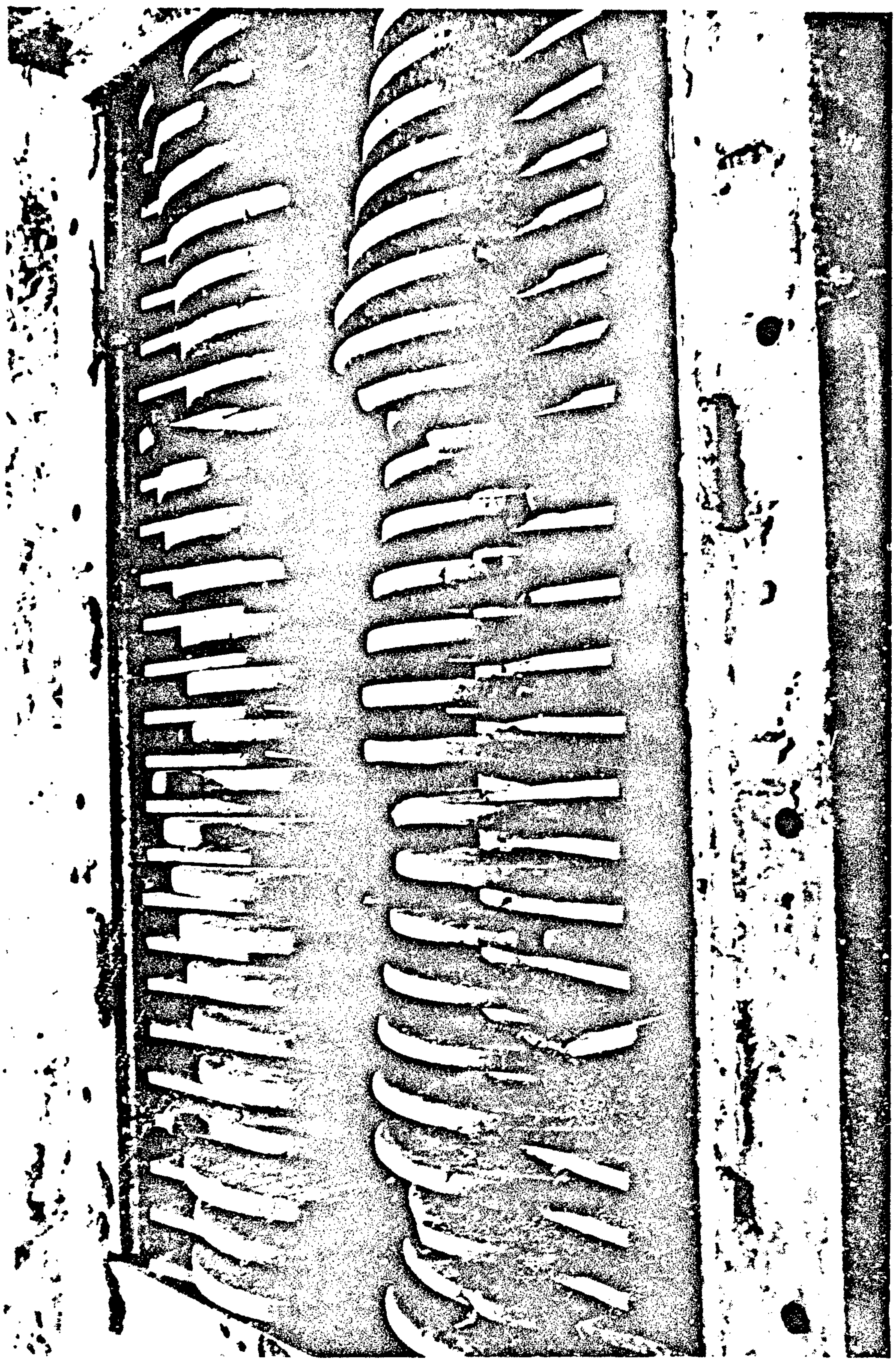

Figure 46. Shredder After Use.

Figure 47. Drag Flight Wear One Side.

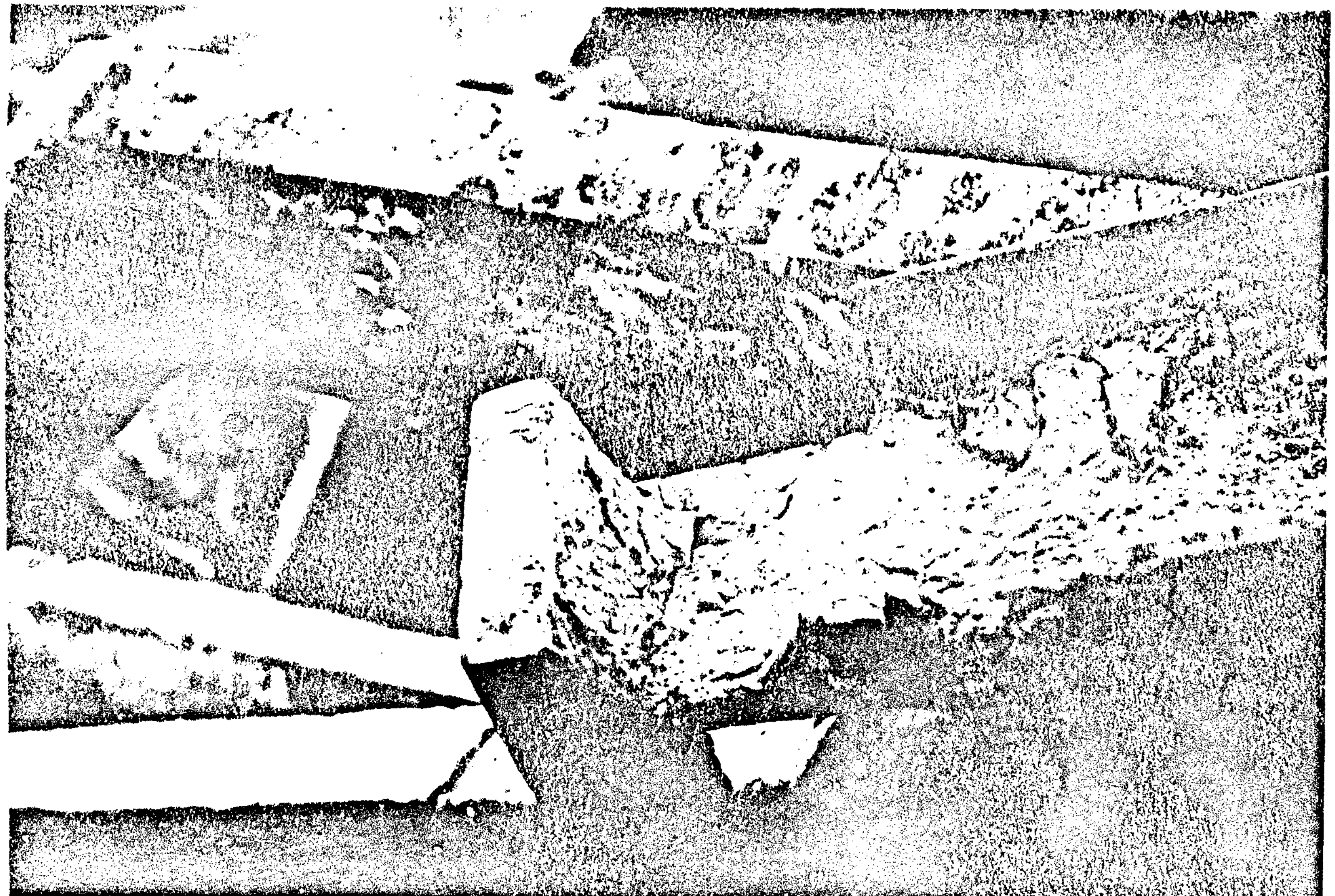

Figure 48. Drag Flight Wear Both Sides.

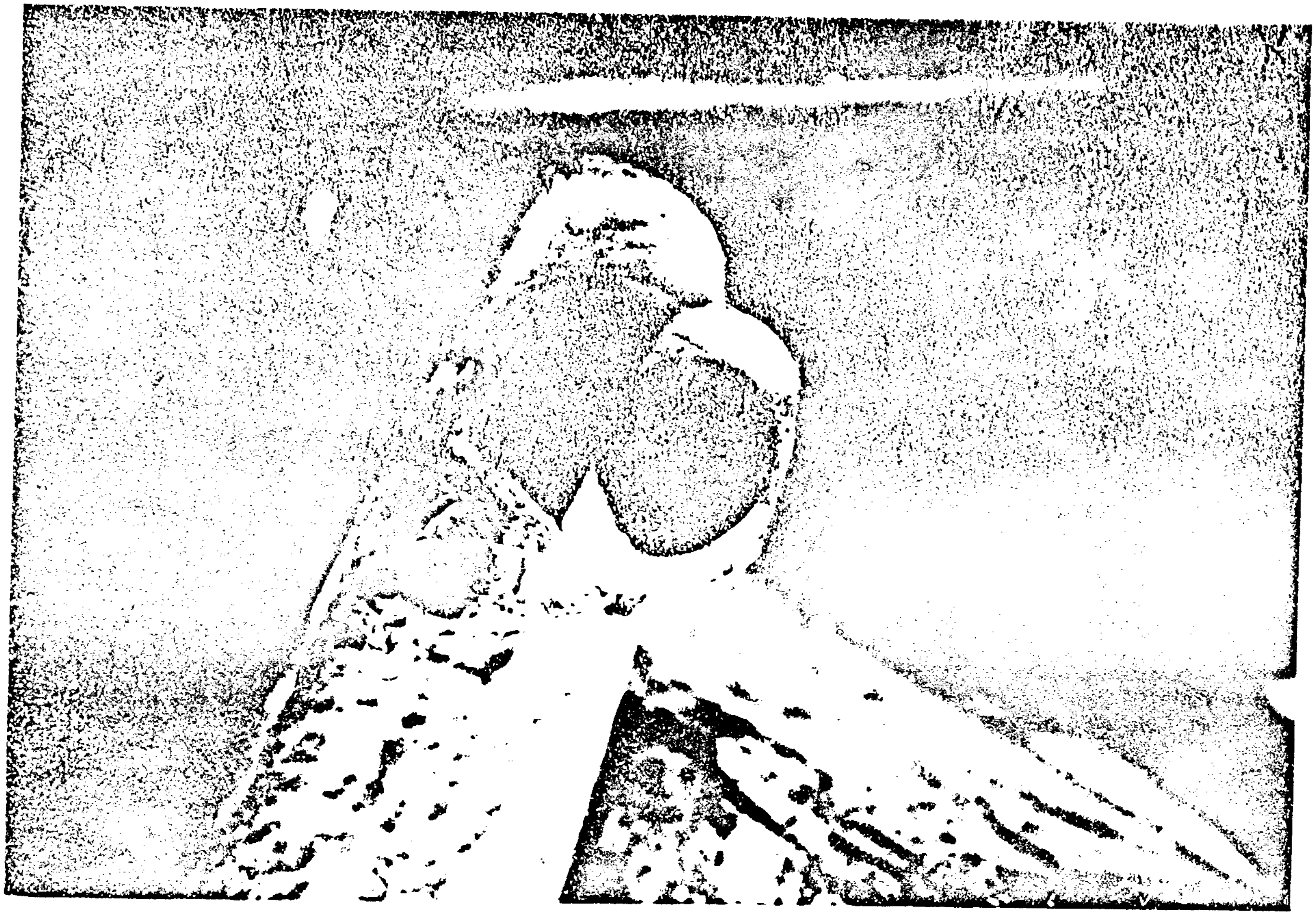

Figure 49. Side Arm Wear on Ash Drag Flights.

Figure 50. Side Arm Wear on Ash Drag Flights.

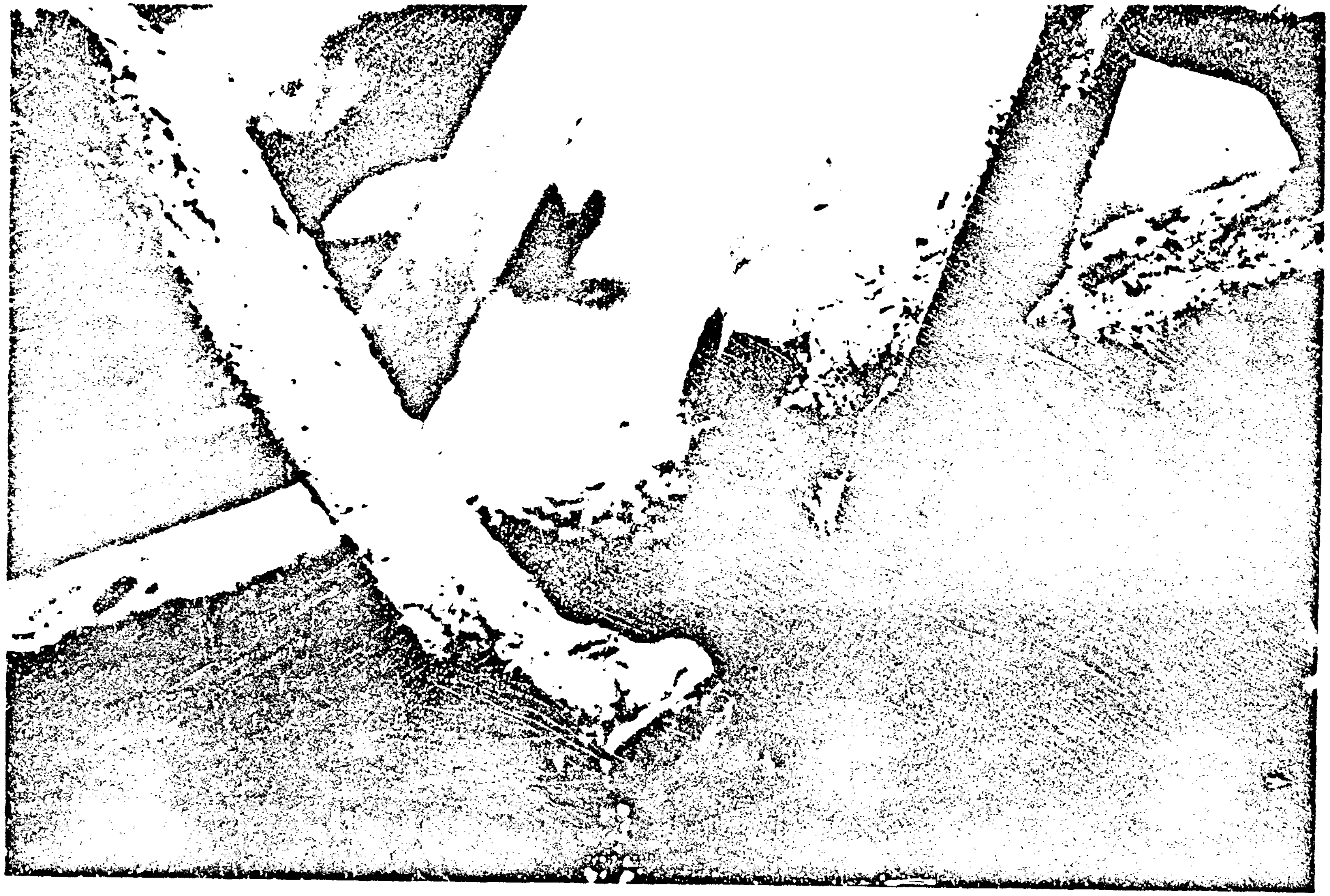

Figure 51. Side Arm Wear on Ash Drag Flights.

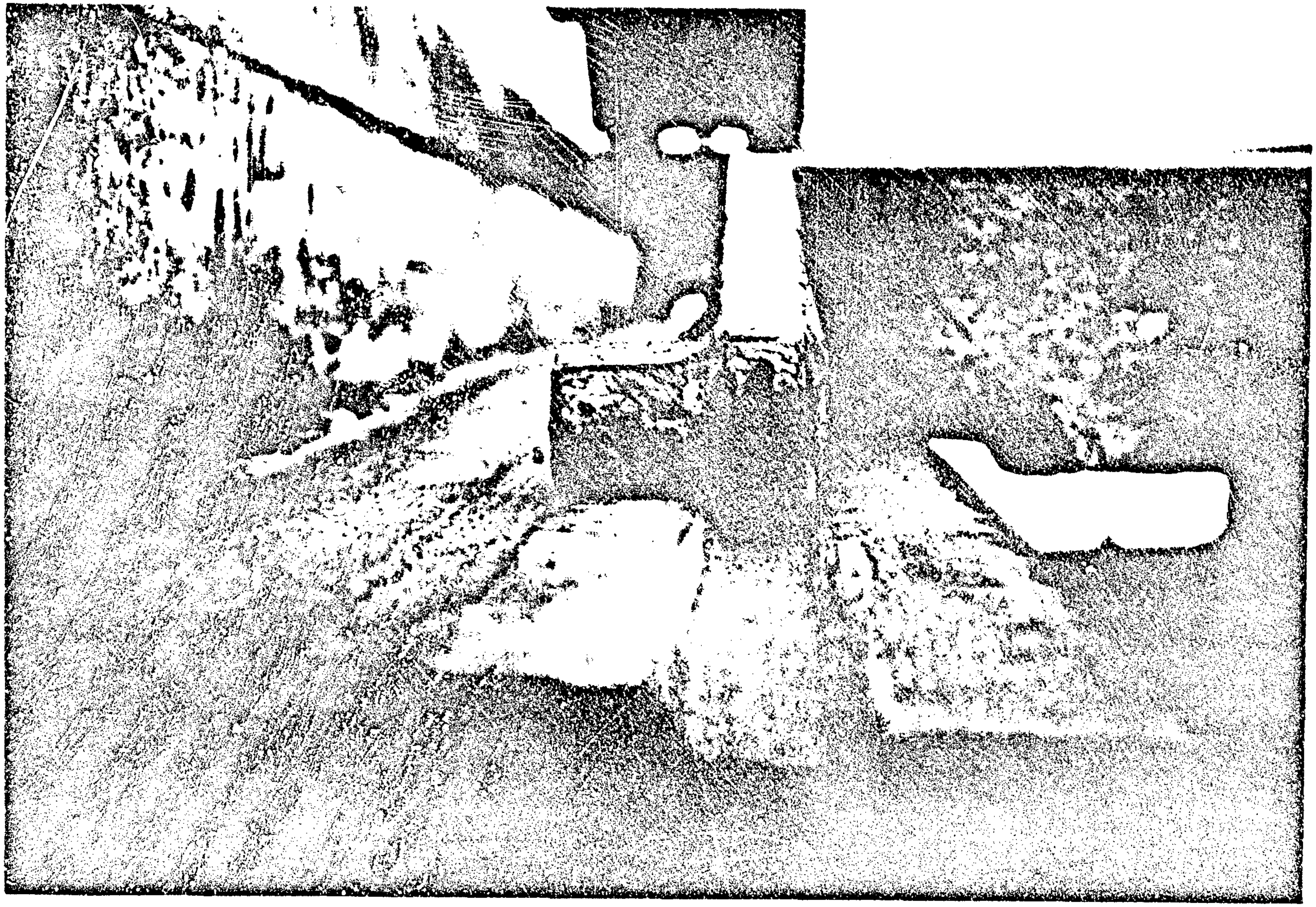

Figure 52. Grooves in Ash Drag Guide Plates.

In front of the drag chute, a pipe was welded across the opening of the chute to knock the ash from the drag flights as they rotated around the drive gears. As can be seen in Figure 53, more than 50% of this knock-off pipe is missing. This pipe was a feature added to the drag chute at NCBC when it was discovered that quite a bit of ash was adhering to the drag flights and not dropping off into the ash pan.

d. Soil Conveyor System Inspection

The inspection of the soil conveyor system showed extensive wear on several of the rollers where the conveyor belt rubbed. The holes worn in some of the rollers are shown in Figures 54 through 57. Virtually all of the roller had flat spots from continuously rubbing the conveyor belt.

Because the conveyor belt was burned in the incinerator at the end of the project, it was not inspected. However, during the year of soil processing, the conveyor belt broke several times requiring it to be respliced. The breaks in the conveyor belt were usually caused by foreign objects (metal rods, tools, etc.) tearing holes in the conveyor belt.

e. Effluent Neutralization Tank (ENT) Inspection

An inspection at the end of the project showed no changes to the particulate tank itself; however, the lemallas (baffles) in the tank were packed with particulate. During the project, attempts were made to clean the lemallas but apparently only resulted in cleaning the center portion. The lemallas are made from a thin, corrugated plastic and are used to: (1) slow the water flow in the ENT and (2) provide a large surface area for the particulate to collect.

To completely clean the ENT, it was necessary to remove the lemallas. Because of their prolonged exposure to hot water, the lemallas had become very brittle; therefore, during their removal from the ENT, they broke into several pieces. Figures 58 through 60 show the lemallas being removed from the ENT and compacted with particulate.

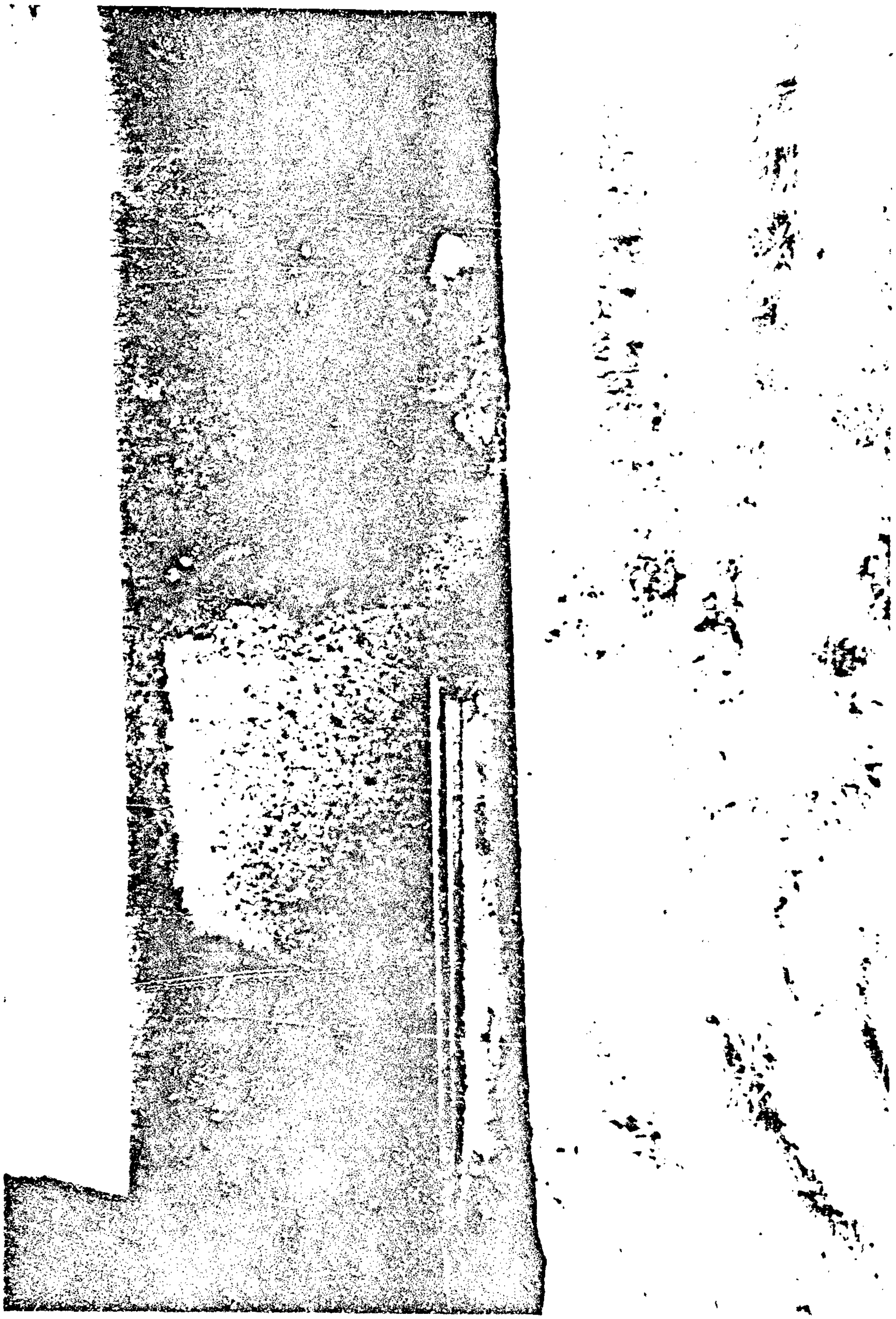

Figure 53. Knock-off Pipe on Ash Drag.

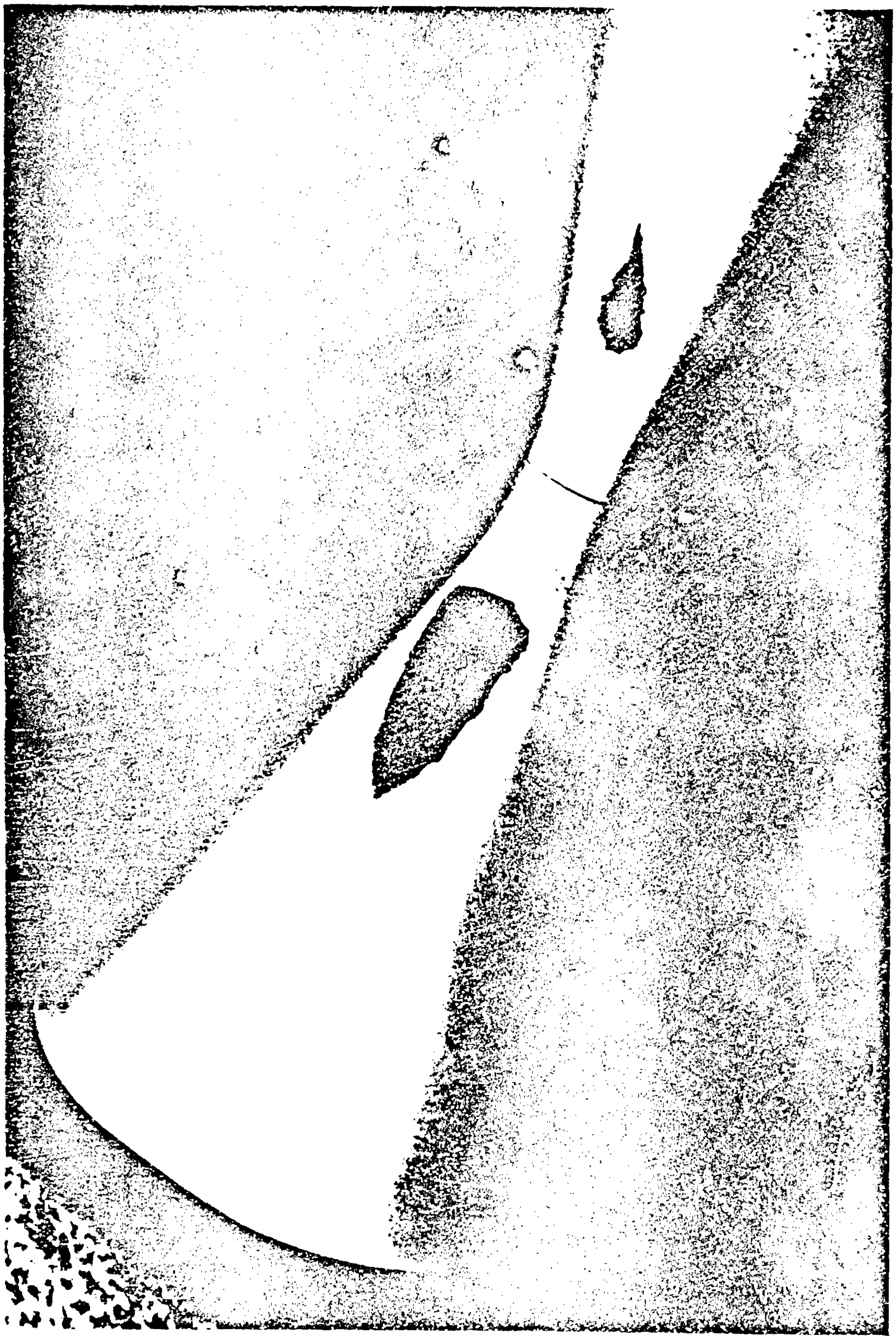

Figure 54. Conveyor Rollers.

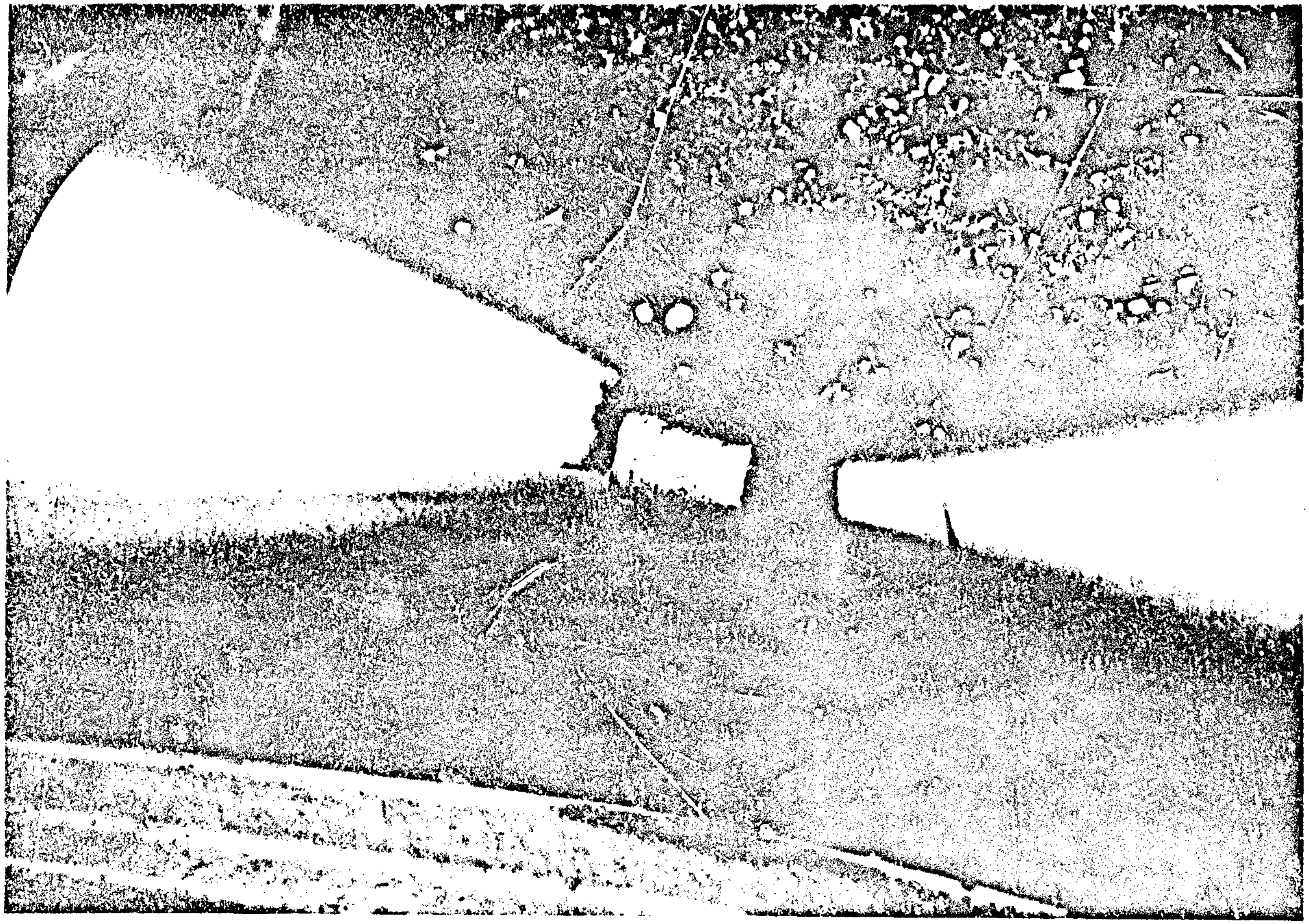

Figure 55. Conveyor Rollers.

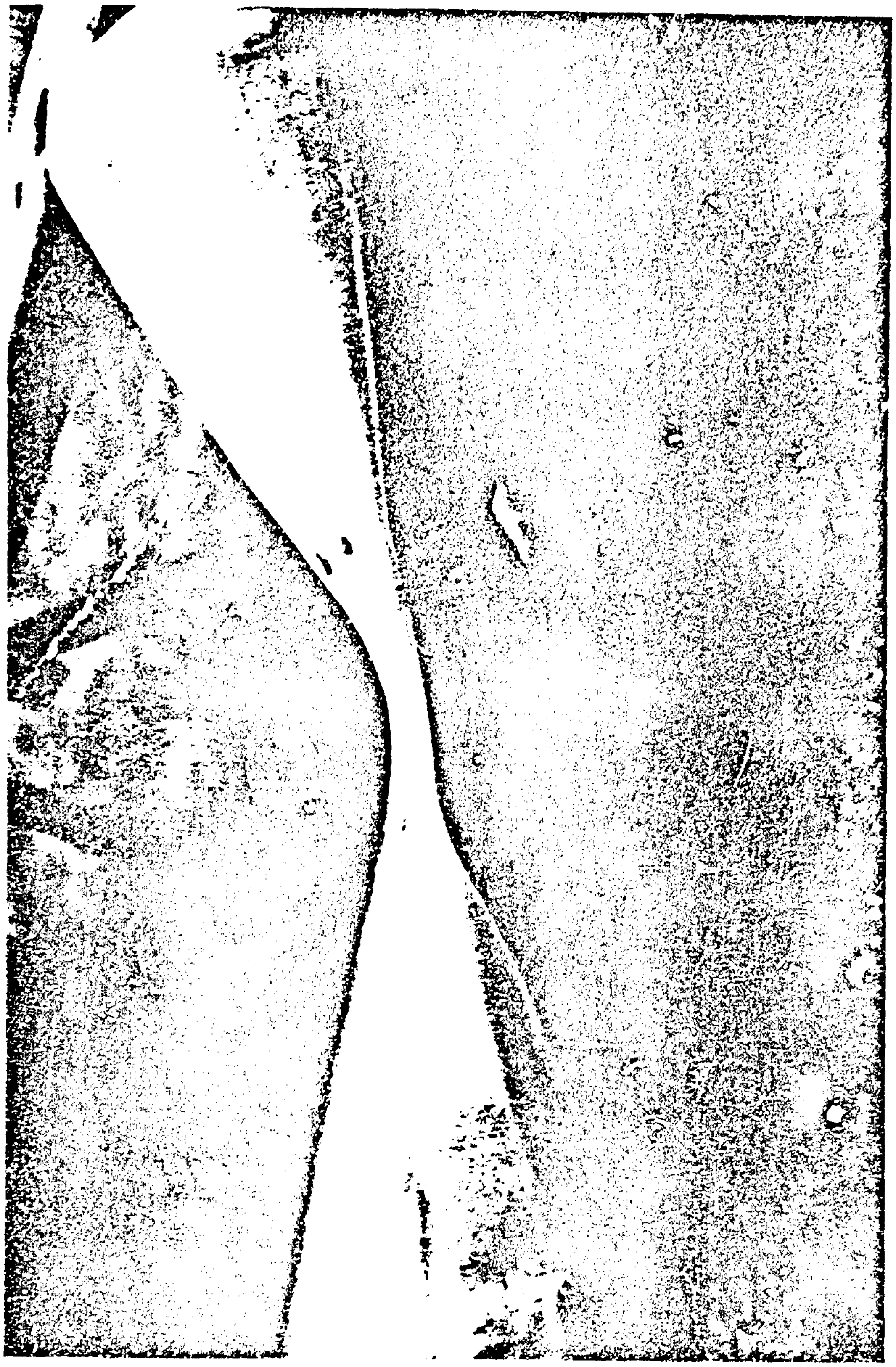

Figure 56. Conveyor Rollers.

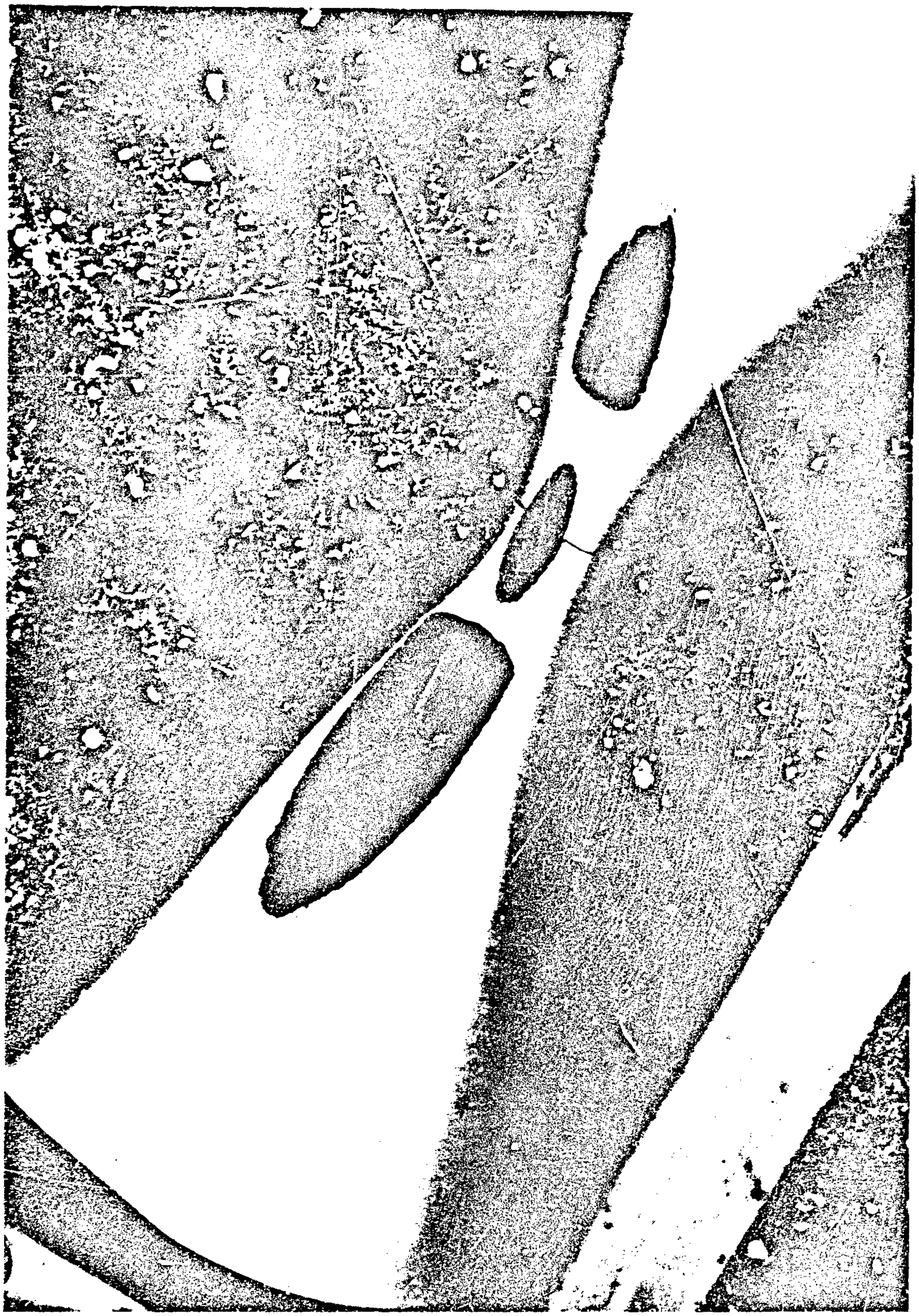

Figure 57. Conveyor Rollers.

Figure 58. Effluent Neutralization Tank Lemallas.

Figure 59. Effluent Neutralization Tank Lemallas.

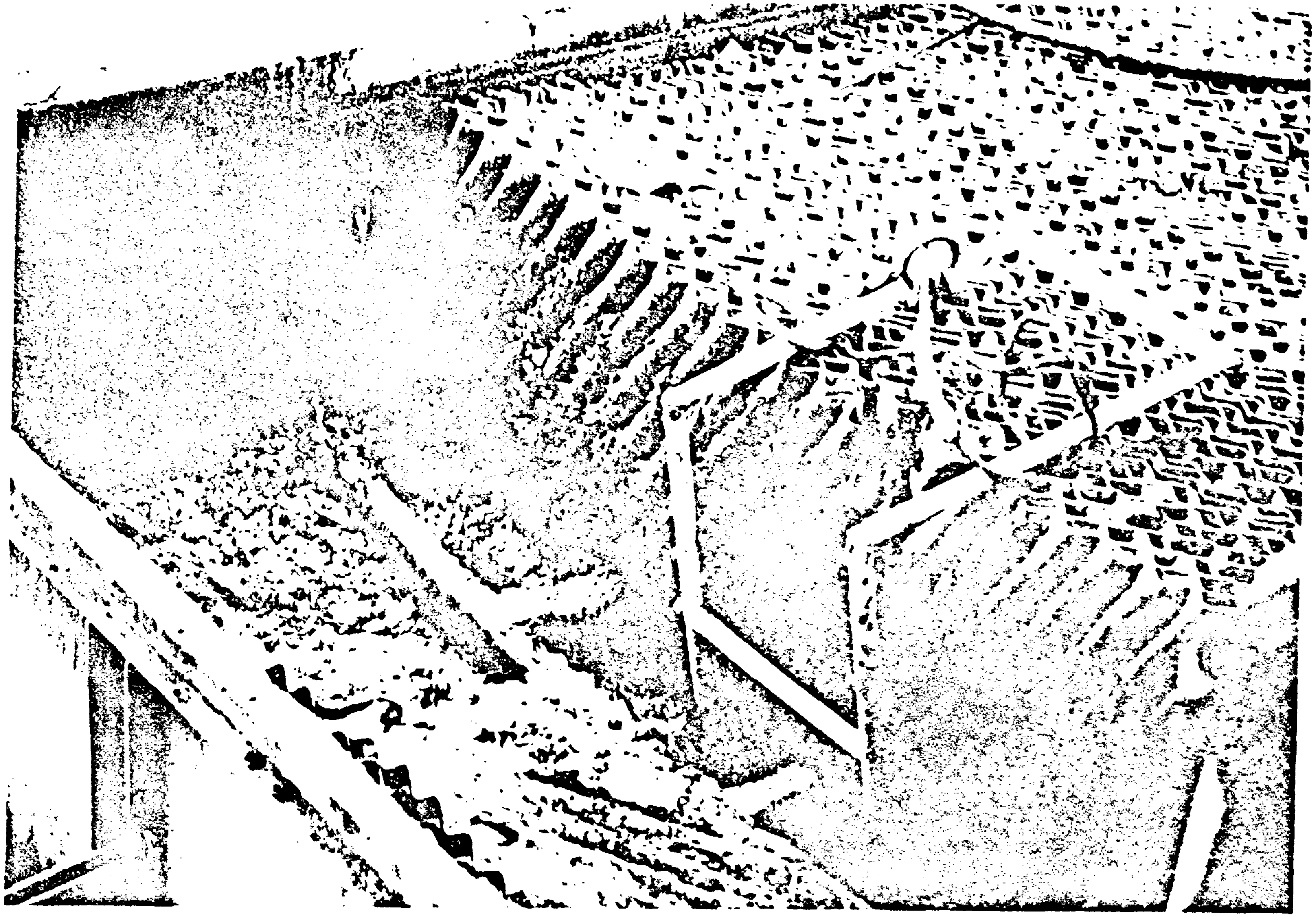

Figure 60. Effluent Neutralization Tank Lemallas.

f. Demister/Demister Pad Inspection

The demister and demister pads were not inspected during the dismantling of the soil processing unit; however, they were inspected during the scheduled outage the first part of November 1988.

The demister was inspected during this outage because small pieces of the plastic demister pads were showing up in the y-strainers of the scrubber pumps. During the inspection, three of the four demister pads showed considerable damage. The damaged pads were replaced with new pads during this scheduled outage. The damaged demister pads are shown in Figures 61 through 63.

Damage to the demister pads is considered normal. The life of the demister pads depends on the water and steam pressure used to keep the draft in the kiln. As the boiler tubes become plugged, the water and steam pressures are increased to compensate for this condition. Because these plastic pads had become brittle during their prolonged exposure to 190°F temperatures, and the increase in pressures tended to break them. Although there are no statistical data to determine the life of the pads, it has been estimated by ENSCO personnel to be 10 months.

g. Particulate Carryover

Particulate carryover from the kiln into the SCC, packed tower, and boiler was the major contributor to scheduled maintenance downtime. Scheduled outages were always based on the quantity of particulate in the SCC, usually 20-25% of SCC capacity. In the early stages of soil processing, those outages occurred approximately every 30 days. Particulate carryover was reduced dramatically, starting in March, by slowing the rotation of the kiln and lowering the draft through the systems. Those actions reduced the source of particulate (fluffing of soil in the kiln) and by decreasing the air velocity through the system, the ability of the airborne particulate to carryover to the boiler was also reduced. This resulted in a scheduled outage for maintenance occurring

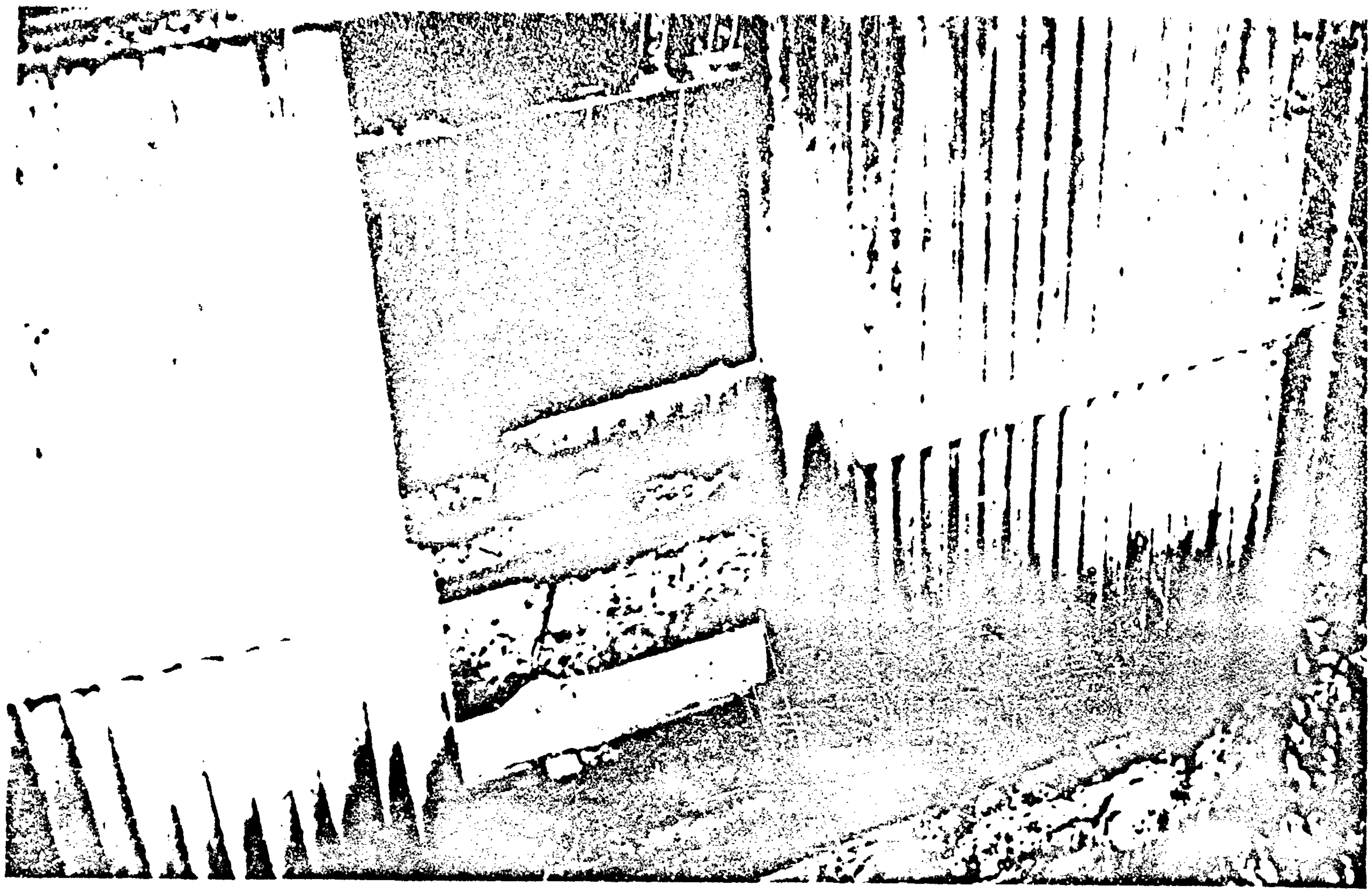

Figure 61. Damaged Demister Pad.

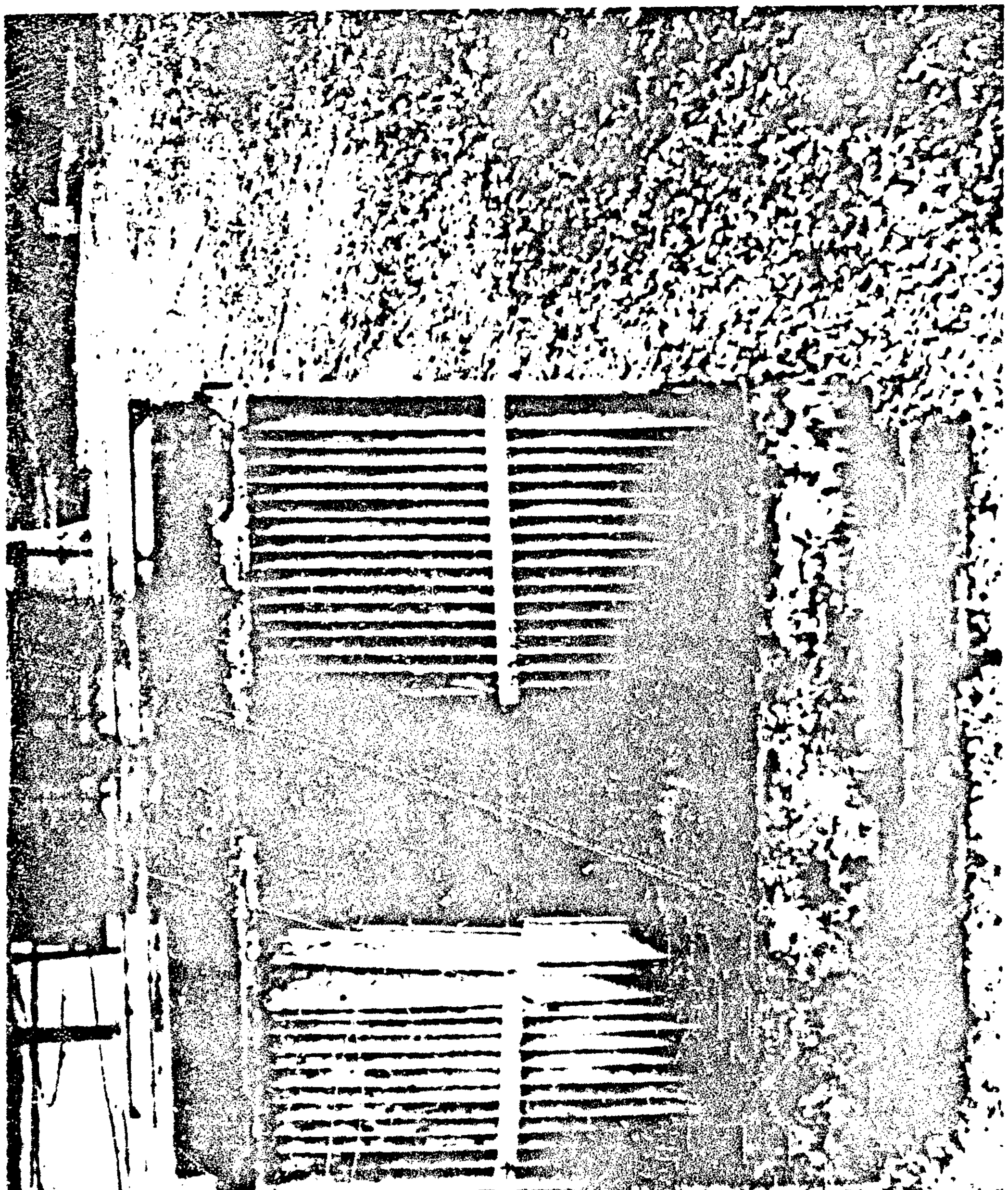

Figure 62. Damaged Demister Pad

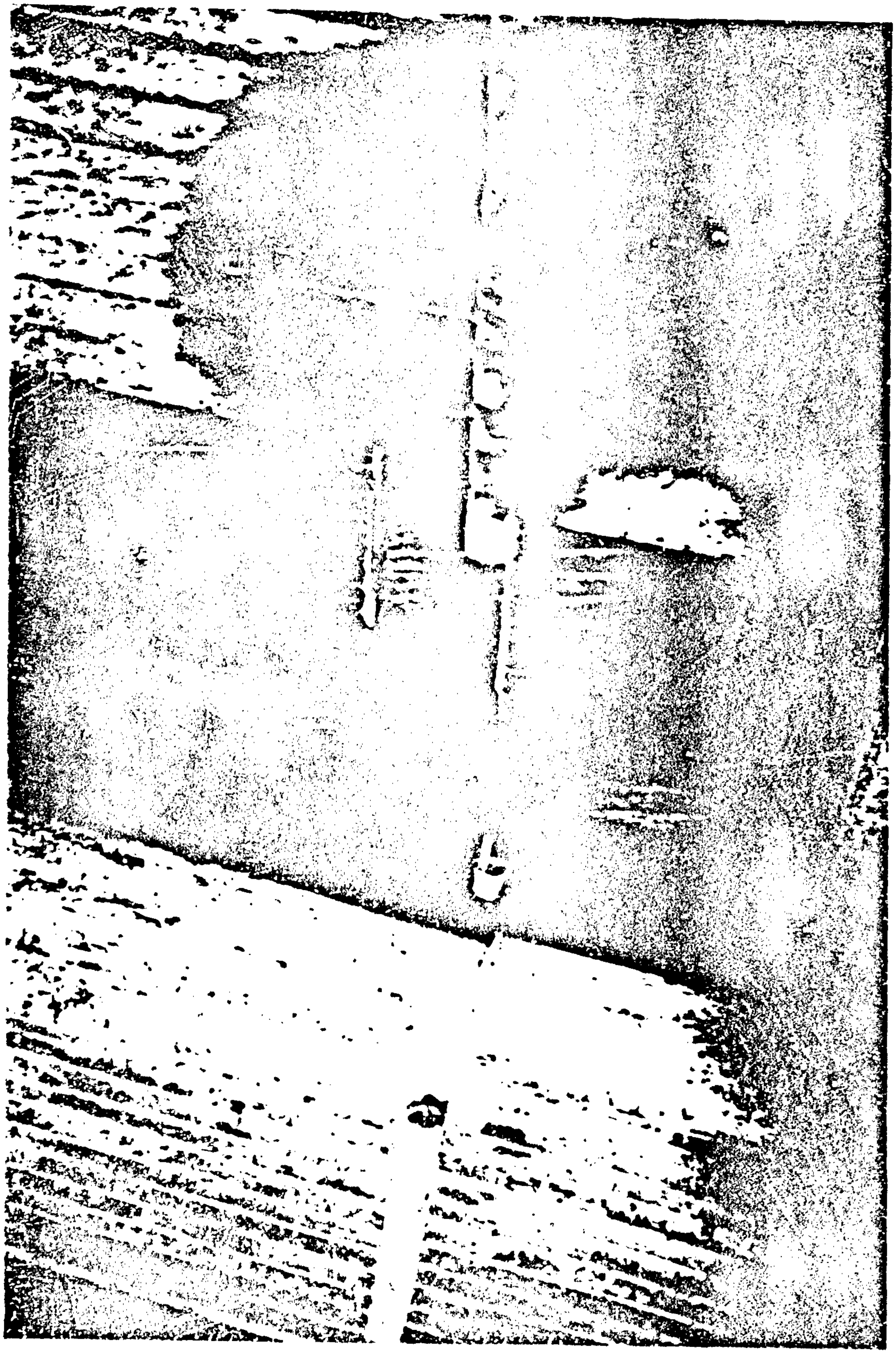

Figure 63. Damaged Demister Pad.

every 59 days for the remainder of the project. The particulate was cleaned from the SCC, boiler, and packed tower every scheduled outage. In addition, approximately every 7 to 10 days the system was shut down for 30 minutes to 4 hours to clean the boiler tubes and scrape the boiler face plate. These outages were usually classified as unscheduled maintenance.

h. Scheduled/Preventive Maintenance

There was no planned scheduled/preventive maintenance for the NCBC Demonstration Project. Maintenance was performed either: (1) after the part or equipment failed, or (2) during so-called "scheduled" outages. The scheduled outages were based on the quantity of particulate in the SCC. When the quantity of particulate in the SCC reached 20-25% of SCC capacity, a scheduled outage was planned. During these outages, repairs were made to equipment that had noticeable defects or had failed during operations but where redundant systems were available to use as backup and avoid unscheduled outages.

i. Use of Gunnite® in Kiln

In early March 1988, while the incinerator was down for scheduled maintenance, a decision was made to replace some missing refractory brick in the kiln. Because refractory brick was not readily available at either the site or at a local vendor, Gunnite® (a grout type material) was used as a replacement. The cost of the Gunnite® repair work was $3,800. Twelve days later the incinerator had to be shutdown to replace the Gunnite®. This unscheduled outage cost $1,137 for the refractory brick, vendor labor, and 31 hours of production time.

j. Feed Auger

The original feed auger for the kiln had to be replaced in February 1988 because of excessive wear (approximately one inch) to the auger flights. To minimize this wear, a design change was made to the auger

flight pitch. The original auger had a six inch pitch for the first 36 inches of its length, which were the loading flights in the feed hopper. For the last 40 inches of the auger, the flights had a 12 inch pitch. The new auger design called for a uniform 12 inch pitch for all flights. Other auger design changes were made during the project and are discussed below.

(1) Auger Shear Bolt

As the first feed auger wore down, it started to wobble inside the auger chute. This wobbling caused the auger shear bolt holes to become elongated (out of round). Although a new auger was installed, the wobbling effect could still take place because of the space around the shear bolt holes. This wobbling caused the shear bolts to snap, which in turn meant an hour or two of downtime to dig the soil out of the feed hopper to replace the bolts. A change in design, placing the shear bolts on the auger shaft outside of the feed hopper was made to expedite this procedure.

(2) Overlay on Auger Flights

The feed augers used on this project were fabricated from stainless steel. The first auger processed 3,325 tons of soil before wearing the flights down to the point that the auger wobbled in the auger chute, which caused the shear bolts to break several times. To minimize the feed auger wear, a 2-inch tungsten carbide cap was plated onto the replacement auger. The auger with overlay processed 11,429 tons of soil before being replaced with a similar type of auger. Measurements showed the auger flights had been worn by approximately 1/2 inch. If left in place, this auger would have processed the remaining 6,500 tons of soil.

k. Kiln Seals

The kiln seals are flexible steel seals between the kiln end plates and the barrel of the kiln. The seals are there to maintain the negative pressure in the kiln. For the first few months of operation, the

seals were allowed to rub directly on the kiln (metal-to-metal friction) resulting in the seals wearing out very rapidly. The periodic use of a lubricant on the replacement seals allowed the seals to last through the remainder of the project.

l. Weigh Hopper/Feed System

The system used on the NCBC Demonstration Project had the weigh hopper/scales first, followed by the shredder. During the processing of large rocks and wood (cross-ties) the shredder would bounce, thus causing the weigh hopper/scale unit to bounce. This resulted in erroneous weight readings and erroneous HAFR interlocks. This problem is not easily corrected and was, therefore, continued throughout the project.

m. Water Jacket on Auger Chute

The water jacket is designed to keep the auger and auger chute cool during processing of high British Thermal Unit (BTU) materials; however, the moisture in the soil processed was enough to keep the auger and auger chute at a cool operating temperature. The water jacket was used until it developed a leak allowing the water to come in contact with the contaminated soil inside of the kiln. The water in the water jacket was also used for the ash drag makeup water and could have carried contamination from the feed auger to the ash drag, thus potentially contaminating the processed soil and jeopardizing delisting and the site cleanup criteria.

SECTION VI
CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The following conclusions were reached as a result of this evaluation. Significant observations are discussed and, where appropriate, recommendations are proposed.

Over the course of the soils incineration operation (the period from November 25, 1987 through November 19, 1988), a total of 26,058.4 tons of soil were processed. This evaluation indicates that the soil composition not only had a significant effect on feed and processing rates, but also on equipment unscheduled maintenance. For example, the months of August and September 1988, required a higher maintenance effort than the preceding months. This was, in part, caused by equipment wear-out (shredder), but was also heavily influenced by a larger-than-usual quantity of steel and large rocks in the soil.

A total of 1,223 maintenance records, which are comprised of 358 scheduled events and 865 unscheduled events, were evaluated. These scheduled and unscheduled maintenance events resulted in component or system downtime for 1,521.6 hours and 899.1 hours, respectively. The system feed auger was shut down for approximately 86% of the unscheduled maintenance events and 98% of the scheduled events. Additionally, 1,081 instrumentation interlock (specific system monitoring set points) records were retained for evaluation. These records showed that a total of 14,461 interlock alarms were received that accounted for 393.7 hours of system downtime. Overall, scheduled maintenance accounts for 56.1% of system downtime, unscheduled maintenance 29.1%, and system interlocks 14.8%.

A few maintenance events were caused by conditions external to the incinerator, e.g., weather and loss of area electrical power. The most significant of these occurred in September 1988. A hurricane alert and

electrical power failures resulted in 64.5 hours of the system downtime. The burning of system-generated trash accounted for an additional 77.7 hours.

The number of events requiring system shutdown dropped significantly during the months of February through June 1988. This is attributed to the system having gone through a break-in period.

The major components that were the largest contributors to the number of failure events and system or component downtimes were the weigh hopper (01), shredder (02), kiln (05), ash drag (06), and system instrumentation (21). Of these components, the shredder required the most maintenance time. In fact, the shredder had to be replaced in September. After the shredder, the kiln and ash drag required the most maintenance time.

The data for most of the components exhibited a random, but somewhat cyclic nature. Only the shredder showed typical wear-out traits that could be compared to the so-called bathtub curve. However, looking at the data overall, typical wear-out patterns are apparent. For those components that required the most maintenance, the amount of system downtime might have been reduced if: (1) necessary spare parts or components were made immediately available and (2) if scheduled (preventive) maintenance had been maintained at a constant level throughout the program (or, adjusted to reflect changes in the unscheduled maintenance rate). Another indicator that should be considered in establishing rates is the component MTBF data.

Instrumentation interlock events also contributed significantly to the number of events and system downtime, especially in the early stages of the program. The LKOD, LKOT, LRT, and HAFR were the largest contributors. Combined, these interlocks accounted for 83% of the number of interlock events and 73% of the interlock related downtime.

The above comments emphasize the problems and potential results that can be experienced in a program of this nature. Because it is not possible to anticipate exactly what will be encountered in the soil, it becomes more

important that the worst be anticipated. Equipment should be as new and up-to-date as possible, an adequate parts inventory should be maintained, and a good preventive maintenance program should be developed and maintained. Equipment that may have minimized system downtime are: (1) magnets to remove metals from the shredder, (2) a sizer to reduce large items to a size easily handled by the shredder, (3) a larger shredder that could handle the types of materials encountered, and (4) screens (possibly a rotating type) that could sort large items out of the feed stream. Before any of these or similar equipment is used, a cost/benefit analysis should be performed.

The overall availability of the incinerator was 68%. This is based on the total available hours for the 360 days of soil processing versus the total downtime for scheduled maintenance, unscheduled maintenance, and instrumentation interlocks of 2,648 hours or 110 days.

B. RECOMMENDATIONS

The following are items that contributed to the availability of the incinerator. Most of these were corrected at some time during the project, while others need corrective action for future projects.

1. Trunnion Rollers

The original trunnion rollers for the kiln were hollow with the bearing plates welded to them. Several of these rollers broke prompting a change to a solid roller. As each hollow roller broke, it was replaced with the new solid type. The solid trunnion rollers cost $2,626 each.

The first trunnion roller to break caused the incinerator to be shut down for approximately 6 hours. This was largely because of the incinerator configuration during the initial setup. The settling bin had been placed between the control room and the kilns, allowing very little room for equipment maneuverability. The settling bin had to be removed before the trunnion roller could be replaced. The settling bin was moved to a new location to prevent a recurrence of this situation.

2. Shredder

During the project, a large volume of protective clothing, wood, ground cloth, and other waste products that required incineration were generated. The shredder used for the first 9 months of the project was inadequate to shred this material for incineration. In the latter part of August 1988, this shredder broke down. The time for repair was estimated to be approximately 2 weeks, as bearings had to be ordered from the factory. A decision was made at that time to purchase a used, larger shredder (Saturn Model No. 5232HT) that would perform much better. Table 23 lists the specifications for the 5232HT shredder. This new shredder also eliminated the need for a wood chipper to cut approximately 600 railroad ties being used by the project for loading and unloading ramps. The shredder was received and installed within a few days, solving many problems. A shredder with similar capabilities should be used for future remediation projects.

Although it did require several attempts to sharpen the teeth, the project was completed with the one set of teeth for the larger shredder.

3. Kiln Seals

The first set of seals (front and back) for the kiln wore out within a few months. When a new set of seals was installed in March, it was suggested a lubricant be used to reduce the friction during the constant rotation of the kiln. Periodically using Molylub^{R} allowed the seals to last through the remainder of the project.

4. Weigh Hopper/Feed System

A necessary design change for future soil incineration projects would be to separate the weighing system from the shredder. The system used had the weigh hopper first and then the shredder; whereas, a better system would be to place the shredder first and then a weighing system completely separate from the shredder. This would eliminate the fluctuations in recorded weights on the computer monitoring system as the shredder bounced around trying to shred rocks and wood. This was especially noticeable during September after the installation of the new shredder, when large

TABLE 23. SATURN 5232HT SHREDDER SPECIFICATIONS

	5232HT
No. of Motors	2
HP of Motors	75
Total Electric Motor HP	150
No. of Hydraulic Pumps	2
Hydraulic Pump Displacement (Cu In/Rev/Pump)	8.69
Total Flow to Hydraulic Motor (GPM)	135.40
Hydraulic Motor	MRH 525
Hydraulic Motor Displacement (Cu In/Rev)	523.90
Hydraulic Motor Shaft Speed (RPM)	59.70
Hydraulic Motor Torque (ft-#'s)	15,941
Shaft Torque (Ft-#'s)	
Slow Shaft	46,771
Fast Shaft	33,875
Gear Ratio	
Slow Shaft	2.934:1
Fast Shaft	2.125:1
Shaft Speed (RPM)	
Slow Shaft	20.30
Fast Shaft	28.10
Cutter diameter (inches)	15.75
Tooth Force (lbs)	71,270

rocks were being processed. On a couple of days, the computer saw weight changes in the weigh hopper equal to 100 tons, when the actual tonnage processed was in the 60-ton range according to the weigh hopper log sheets. Under the same conditions as this project, a conveyor weigh system may probably work better.

5. Water Jacket on Auger Chute

The water jacket is designed to keep the auger and auger chute cool during processing of high BTU materials. The moisture in the soil processed was enough to keep the auger and auger chute at a cool operating temperature. For a similar soil processing project it would probably not be necessary to have this feature. A solid auger chute would be adequate to perform soil processing.

6. Feed Auger

The original feed auger for the kiln had to be replaced in late February 1988 because of excessive wear (approximately one inch) to the auger flights. At that time it was determined that a uniform 12 inch pitch for the auger flights would work best. The replacement auger was fabricated with the uniform 12 inch pitch for all auger flights. Other feed auger design changes are discussed below.

7. Auger Shear Bolt

As the first feed auger wore down, it started to wobble inside the auger chute. This wobbling caused the auger shear bolt holes to become elongated (out of round). Although a new auger was installed, the wobbling effect could still take place because of the space around the shear bolt holes. This wobbling caused the shear bolts to snap, which in turn meant an hour or two of downtime to dig the soil out of the feed hopper to replace the bolts. A change in design, placing the shear bolts on the auger shaft outside of the feed hopper was made, expediting this procedure.

8. Overlay on Auger Flights

The feed augers used on this project were fabricated from stainless steel. The first auger processed 3,325 tons of soil before wearing the flights down to the point that the auger wobbled in the auger chute causing the shear bolts to break several times. To minimize the feed auger wear, a 2-inch tungsten carbide cap was plated onto the first replacement auger. The auger with overlay processed 11,429 tons of soil before being replaced with a similar type. Measurements showed the auger flights had been worn approximately 1/2 inch. If left in place, this auger would have processed the remaining 6,500 tons of soil.

9. Setting Process Equipment on Contaminated Plots

During the initial setup of the incinerator in the fall of 1986, the weigh hopper/conveyor system was set on plots already characterized as being contaminated. As the project neared completion, it became necessary to move the weigh hopper/conveyor system to complete soil excavation. The unit downtime to complete this change was approximately four days, at a cost of $100,000 (based on an estimated cost of $25,000 per day). For the NCBC Demonstration Project, setting equipment on contaminated plots was unavoidable. Regardless of the original positioning of the equipment, it had to be moved to complete soil excavation.

10. Using Gunnite[R] As Replacement for Refractory Brick

In early March 1988, during a schedule outage, a decision was made to replace some of the loose refractory brick. Rather than replacing the loose brick with new brick, a decision, based on the vendor's evaluation, was made to patch the area with Gunnite[R] (a grout type material). The Gunnite[R] patch lasted less than two weeks, at which time the unit was shut down again to make repairs. The second repair was made using refractory brick.

It is very probable that the Gunnite® material would hold up under normal operating conditions; however, the abrasive materials that were being processed at NCBC probably contributed to the early failure of the Gunnite®.

11. Particulate Carryover

Particulate carryover from the kiln into the SCC, packed tower, and boiler was the major contributor to scheduled maintenance downtime. Scheduled outages were always based on the quantity of particulate in the SCC, usually 20-25% of SCC capacity. In the early stages of soil processing, those outages occurred approximately every 30 days. Particulate carryover was reduced dramatically, starting in March 1988, by slowing the rotation of the kiln, and lowering the draft through the system, resulting in a scheduled outage for maintenance occurring every 59 days for the remainder of the project. The particulate was cleaned from the SCC, boiler, and packed tower every scheduled outage. In addition, it was often necessary (approximately every 7 to 10 days), to shut down the system for 2 to 4 hours to clean the boiler tubes or scrape the boiler face. These outages were usually classified as unscheduled maintenance. The operating changes mentioned above were made to minimize the inadequacy of the cyclone separators. To fully resolve the particulate carryover problem, a change should be made in the design of the cyclones.

12. Preventive Maintenance

The lack of a comprehensive preventive maintenance program was another major contributor to system availability. In this case, it was usually in the form of unscheduled maintenance. The lack of a preventive maintenance program resulted in either finding mechanical problems during scheduled outages or the part or subsystem failing during operations. Depending on the part or subsystem, a failure during operations often resulted in a shut down of the incinerator.

SECTION VII
REFERENCES

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2. Haley, D. J. and Thomas, R. W., EG&G Idaho, Full-Scale Incinerator System Demonstration at the Naval Construction Battalion Center, Gulfport, MW Volume II: Verification Burn for the USAF Installation Restoration Program, ESL-TR-89-39, Headquarters, Air Force Engineering and Services Center, Tyndall Air Force Base, Florida, (in press).

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APPENDIX A

SCHEDULED MAINTENANCE FORM

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SCHEDULED MAINTENANCE REPORT FORM

(Item or Component Maintained) (Sub system Number)

(Component Number)

(Date) (Hours Minutes) Time system went down

(Date) (Hours Minutes) Time system operation resumed

(Date) (Hours Minutes) Total system down time.

(Date) (Hours Minutes) Time component went down

(Date) (Hours Minutes) Time component operational

(Hours Minutes) Total time attributable to this maintenance.

(Hours Minutes) Time to switch to redundant system, if used.

Description of maintenance performed

Comments (Use back of form if additional space is needed)

Include in comments the root cause (component failure) of maintenance)

Estimated cost associated with maintenance/repair

Labor (man hours)

Parts ($)

Could design modification have prevented problem? Yes

No

(Person completing form) (Date) (Reviewer) (Date)

Note: Record all items repaired whether or not they may cause the overall plant to shut down!

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APPENDIX B

UNSCHEDULED MAINTENANCE FORM

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UNSCHEDULED MAINTENANCE REPORT FORM

(Description of Item Repaired) (Sub system Number)

(Component Number)

(Date) (Hours : Minutes) Time system went down.

(Date) (Hours : Minutes) Time system operation resumed.

(Date) (Hours : Minutes) Total system down time.

(Date) (Hours : Minutes) Time component went down.

(Date) (Hours : Minutes) Time component operational

(Hours : Minutes) ☐ Total time attributable to this repair* or
☐ Repair time (check which)
*(Total repair time includes administrative time)

(Hours : Minutes) Time to switch to redundant system, if used.

Where was component repaired? (circle) on-site/off-site is above component downtime attributable to:
☐ Demand failure
☐ Operational failure
☐ Preventive maintenance

Comments: (Use back of form if additional space is needed)

(Include in comments the root-cause (component failure) of maintenance)

Estimated cost associated with maintenance/repair: Labor ________ (man hours)

Parts ________ ($)

Could preventive maintenance have prevented problem? ______ Yes ______ No

Could design modification have prevented problem? ______ Yes ______ No

(Person completing form) (Date) (Reviewer) (Date)

Note: Record all items repaired whether or not they cause the overall plant to shut down!

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APPENDIX C

MAINTENANCE DATA BASE

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
1	11/25/87	U	04	04	10	0.00	0	PL	-
2	11/27/87	U	0508	05	433	0.00	0	PL	-
3	11/27/87	U	0304	03	3	0.00	0	BD	+
4	11/27/87	S	2103	21	8	0.00	0	CL	-
5	11/27/87	U	0202	02	3	0.00	0	PL	+
6	11/27/87	U	0503	05	30	0.00	0	FO	-
7	11/27/87	U	0	0	0	0.00	0	LP	-
8	11/28/87	U	06	06	23	0.00	0	UN	-
9	11/28/87	U	06	06	1089	0.00	0	UN	-
10	11/28/87	U	0508	05	385	0.00	0	PL	-
11	11/28/87	S	2103	21	35	0.00	0	CL	-
12	11/29/87	U	01	01	5	0.00	0	PL	+
13	11/29/87	U	01	01	32	0.00	0	PL	-
14	11/29/87	U	01	01	11	0.00	0	PL	-
15	11/30/87	S	2103	21	35	0.00	0	CL	-
16	11/30/87	U	0503	05	321	0.00	0	FO	-
17	11/30/87	U	0802	08	920	0.00	0	FO	-
18	11/30/87	U	04	04	3	0.00	0	PL	+
19	12/01/87	U	0503	05	7	0.00	0	FO	-
20	12/01/87	U	0503	05	1	0.00	0	FO	-
21	12/02/87	U	0301	03	12	0.00	0	UN	+
22	12/03/87	U	0503	05	10	0.00	0	FO	-
23	12/03/87	U	0302	03	39	0.00	0	UN	-
24	12/03/87	S	2103	21	108	0.00	0	CL	-
25	12/05/87	S	2103	21	6	0.00	0	CL	-
26	12/05/87	U	0101	01	91	0.00	0	UN	-
27	12/05/87	U	210202	21	30	0.00	0	UN	-
28	12/05/87	U	0503	05	71	0.00	77	MA	-
29	12/05/87	U	0503	05	19	0.00	0	FO	-
30	12/05/87	U	0503	05	44	0.00	0	FO	-
31	12/06/87	S	2103	21	30	0.00	0	CL	-
32	12/06/87	U	0202	02	26	0.00	0	BD	-
33	12/06/87	U	0202	02	12	0.00	0	BD	-
34	12/07/87	S	230204	23	30	0.00	0	MA	+
35	12/07/87	U	0202	02	59	0.00	0	BD	-
36	12/07/87	S	0	0	6981	0.00	0	MA	-
37	12/07/87	S	1001	10	0	4.00	0	MA	
38	12/07/87	S	1701	17	0	1.00	0	MA	
39	12/07/87	S	1301	13	0	1.00	0	MA	
40	12/07/87	S	08	08	0	8.00	975	MA	

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
41	12/07/87	S	0502	05	0	12.00	0	MA	
42	12/07/87	S	0801	08	0	4.00	0	MA	
43	12/07/87	S	1001	10	0	1.00	0	MA	
44	12/07/87	S	2103	21	43	0.00	0	CL	-
45	12/12/87	U	0503	05	4	0.00	0	FO	-
46	12/12/87	U	0503	05	4	0.00	0	FO	-
47	12/12/87	U	0503	05	4	0.00	0	FO	-
48	12/12/87	U	0503	05	3	0.00	0	FO	-
49	12/12/87	U	0503	05	5	0.00	0	FO	-
50	12/12/87	U	0503	05	63	0.00	0	FO	-
51	12/13/87	U	0503	05	67	0.00	0	FO	-
52	12/13/87	U	0503	05	5	0.00	0	FO	-
53	12/13/87	U	01	01	10	0.00	0	PL	+
54	12/13/87	U	0503	05	13	0.00	0	FO	-
55	12/13/87	S	0	0	1732	0.00	0	MA	-
56	12/13/87	S	1002	10	0	4.00	0	MA	
57	12/13/87	S	2103	21	0	0.50	0	MA	
58	12/13/87	S	210205	21	0	0.00	0	MA	
59	12/13/87	U	0503	05	8	0.00	0	FO	-
60	12/13/87	U	0202	02	132	0.00	0	BD	-
61	12/13/87	U	0503	05	6	0.00	0	FO	-
62	12/13/87	U	01	01	13	0.00	0	PL	-
63	12/13/87	U	0503	05	9	0.00	0	FO	-
64	12/13/87	U	01	01	9	0.00	0	PL	+
65	12/13/87	U	0503	05	18	0.00	0	FO	-
66	12/13/87	U	0503	05	11	0.00	0	FO	-
67	12/13/87	U	01	01	4	0.00	0	PL	+
68	12/13/87	U	01	01	4	0.00	0	PL	+
69	12/13/87	U	0503	05	3	0.00	0	FO	-
70	12/13/87	U	01	01	6	0.00	0	PL	+
71	12/13/87	U	0503	05	6	0.00	0	FO	-
72	12/15/87	U	0503	05	6	0.00	0	FO	-
73	12/15/87	U	01	01	16	0.00	0	PL	-
74	12/15/87	U	0411	04	12	0.00	77	UN	-
75	12/15/87	U	01	01	4	0.00	0	PL	+
76	12/16/87	U	0304	03	14	0.00	0	PL	-
77	12/16/87	U	0306	03	5	0.00	0	UN	+
78	12/17/87	U	0304	03	240	0.00	0	PL	-
79	12/17/87	U	0304	03	1	0.00	0	PL	+
80	12/17/87	U	0304	03	6	0.00	0	PL	+

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
81	12/17/87	S	2103	21	30	0.00	0	CL	-
82	12/17/87	U	0503	05	21	0.00	0	FO	-
83	12/17/87	S	2103	21	11	0.00	0	CL	-
84	12/17/87	U	0304	03	6	0.00	0	PL	+
85	12/17/87	U	0503	05	15	0.00	0	FO	-
86	12/17/87	U	0304	03	3	0.00	0	PL	+
87	12/18/87	U	01	01	38	0.00	0	PL	-
88	12/18/87	S	2103	21	30	0.00	0	CL	-
89	12/18/87	U	0503	05	33	0.00	0	FO	-
90	12/19/87	U	0503	05	24	0.00	0	FO	-
91	12/19/87	U	0503	05	40	0.00	0	FO	-
92	12/19/87	S	2103	21	60	0.00	0	CL	-
93	12/20/87	U	050608	05	58	0.00	0	MA	-
94	12/20/87	S	2103	21	33	0.00	0	CL	-
95	12/20/87	U	160105	16	30	0.00	0	PL	+
96	12/21/87	S	0	0	9000	0.00	0	MA	-
97	12/21/87	S	1001	10	0	4.00	0	MA	
98	12/21/87	S	1301	13	0	1.00	0	MA	
99	12/21/87	S	0504	05	0	2.00	0	MA	
100	12/21/87	S	1002	10	0	2.00	0	MA	
101	12/21/87	S	1603	16	0	6.00	0	MA	
102	12/21/87	S	08	08	0	8.00	561	MA	
103	12/21/87	S	050801	05	0	8.00	0	MA	
104	12/21/87	S	160105	16	0	1.00	0	MA	
105	12/21/87	S	0501	05	0	24.00	124	MA	
106	12/28/87	S	180102	18	180	0.00	224	MA	+
107	12/28/87	U	0202	02	121	0.00	0	PL	-
108	12/28/87	U	0202	02	8	0.00	0	PL	+
109	12/28/87	U	01	01	13	0.00	0	PL	-
110	12/29/87	U	0503	05	2	0.00	0	FO	-
111	12/29/87	U	0304	03	109	0.00	0	PL	-
112	12/29/87	U	01	01	7	0.00	0	HE	-
113	12/29/87	U	01	01	7	0.00	0	PL	+
114	12/29/87	U	01	01	7	0.00	0	HE	-
115	12/30/87	S	2103	21	12	0.00	0	CL	-
116	12/31/87	U	01	01	70	0.00	0	PL	-
117	12/31/87	U	2102	21	210	0.00	0	LP	-
118	12/31/87	U	05[illegible]	05	360	0.00	0	MA	-
119	12/31/87	U	2103	21	0	0.50	0	CL	-
120	12/31/87	U	020302	02	0	0.50	0	MA	-

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
121	12/31/87	U	1002	10	0	1.00	0	MA	-
122	12/31/87	U	0802	08	210	0.00	0	FO	-
123	01/01/88	U	0503	05	13	0.00	0	FO	-
124	01/02/88	U	0202	02	25	0.00	0	PL	-
125	01/02/88	S	2103	21	11	0.00	0	CL	-
126	01/02/88	U	0304	03	43	0.00	0	PL	-
127	01/02/88	U	1002	10	9	0.00	0	MA	-
128	01/02/88	U	01	01	11	0.00	0	PL	+
129	01/02/88	U	01	01	25	0.00	0	PL	-
130	01/03/88	U	0201	02	11	0.00	0	MA	-
131	01/03/88	S	0	0	253	0.00	0	MA	-
132	01/03/88	S	1603	16	0	2.00	0	MA	
133	01/03/88	S	1002	10	0	0.50	0	MA	
134	01/03/88	S	09	09	0	1.00	0	MA	
135	01/03/88	S	0507	05	0	1.00	0	MA	
136	01/03/88	U	01	01	32	0.00	0	PL	-
137	01/03/88	U	01	01	18	0.00	0	PL	-
138	01/03/88	U	0201	02	108	0.00	0	MA	-
139	01/04/88	U	0202	02	104	0.00	0	BD	-
140	01/04/88	S	2103	21	25	0.00	0	CL	-
141	01/04/88	U	2114	21	30	0.00	0	CL	+
142	01/04/88	U	2112	21	40	0.00	313	MA	-
143	01/05/88	S	2103	21	6	0.00	0	CL	-
144	01/05/88	U	0701	07	30	0.00	0	PL	+
145	01/05/88	U	0508	05	93	0.00	0	PL	-
146	01/05/88	U	0503	05	18	0.00	0	FO	-
147	01/05/88	U	260304	26	27	0.00	0	PL	+
148	01/06/88	U	040101	04	118	0.00	0	MA	-
149	01/06/88	S	180201	18	120	0.00	309	MA	-
150	01/06/88	S	1405	14	120	0.00	309	MA	-
151	01/07/88	S			6096	0.00	0	MA	-
152	01/11/88	U	180102	18	1313	0.00	0	MA	-
153	01/11/88	U	180102	18	0	0.00	0	MA	+
154	01/12/88	S	0	0	1327	0.00	0	MA	-
155	01/12/88	S	180102	18	0	3.00	224	MA	
156	01/12/88	S	160103	16	0	2.00	0	MA	
157	01/12/88	S	040303	04	0	1.00	666	MA	
158	01/12/88	U	0802	08	19	0.00	0	FO	-
159	01/12/88	S	180102	18	180	0.00	224	MA	+
160	01/12/88	U	0408	04	7	0.00	160	MA	-

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
161	01/12/88	U	0202	02	7	0.00	0	PL	+
162	01/12/88	U	01	01	6	0.00	0	PL	+
163	01/13/88	U	01	01	0	0.00	0	PL	+
164	01/13/88	U	040101	04	26	0.00	0	MA	-
165	01/13/88	U	0402	04	3	0.00	0	MA	+
166	01/13/88	S	2103	21	33	0.00	0	CL	-
167	01/14/88	S	2101	21	30	0.00	0	MA	+
168	01/14/88	U	010102	01	0	0.00	0	UN	+
169	01/14/88	S	010102	01	98	2.50	670	MA	-
170	01/15/88	U	0304	03	6	0.00	0	PL	+
171	01/15/88	U	0304	03	3	0.00	0	PL	+
172	01/15/88	U	01	01	14	0.00	0	MA	-
173	01/15/88	U	04	04	2	0.00	0	PL	+
174	01/15/88	U	01	01	43	0.00	0	PL	-
175	01/15/88	S	2103	21	10	0.00	0	CL	-
176	01/15/88	U	0304	03	14	0.00	0	MA	-
177	01/16/88	S	2103	21	14	0.00	0	CL	-
178	01/16/88	U	01	01	5	0.00	0	PL	+
179	01/16/88	U	1002	10	50	0.00	0	MA	-
180	01/16/88	U	0401	04	4	0.00	0	PL	-
181	01/16/88	U	01	01	20	0.00	0	PL	-
182	01/17/88	U	16	16	210	0.00	0	PL	-
183	01/17/88	U	0401	04	4	0.00	0	MA	-
184	01/17/88	U	01	01	20	0.00	0	PL	-
185	01/18/88	U	04	04	1	0.00	0	PL	-
186	01/18/88	U	2103	21	67	0.00	85	CL	-
187	01/18/88	U	080204	08	22	0.00	0	MA	-
188	01/18/88	U	01	01	9	0.00	0	PL	-
189	01/18/88	U	01	01	37	0.00	0	PL	-
190	01/18/88	U	01	01	50	0.00	0	PL	-
191	01/18/88	U	01	01	36	0.00	0	PL	-
192	01/18/88	U	01	01	16	0.00	0	PL	-
193	01/18/88	U	01	01	7	0.00	0	PL	+
194	01/18/88	U	01	01	55	0.00	0	PL	-
195	01/19/88	U	01	01	5	0.00	0	PL	+
196	01/19/88	S	2103	21	13	0.00	0	CL	-
197	01/19/88	U	01	01	2	0.00	0	PL	+
198	01/19/88	U	01	01	1	0.00	0	PL	+
199	01/19/88	U	01	01	11	0.00	0	PL	+
200	01/20/88	S	0	0	128	0.00	313	MA	-

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE -Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
201	01/20/88	S	1602	16	0	1.00	0	MA	
202	01/20/88	S	2112	21	0	0.50	313	MA	
203	01/20/88	S	0304	03	0	0.00	0	MA	
204	01/20/88	S	1002	10	0	0.50	0	MA	
205	01/20/88	U	0503	05	16	0.00	0	FO	-
206	01/20/88	S	2103	21	31	0.00	0	CL	-
207	01/20/88	U	210301	21	6	0.00	0	CL	-
208	01/21/88	U	0202	02	2	0.00	0	BD	+
209	01/21/88	U	0702	07	60	0.00	0	MA	+
210	01/21/88	U	0202	02	3	0.00	0	PL	+
211	01/21/88	U	01	01	14	0.00	0	PL	-
212	01/21/88	U	0202	02	19	0.00	0	BD	-
213	01/21/88	U	0503	05	5	0.00	0	FO	-
214	01/21/88	U	0202	02	380	0.00	3512	MA	-
215	01/22/88	U	0503	05	46	0.00	0	FO	-
216	01/22/88	S	2103	21	13	0.00	0	CL	-
217	01/22/88	U	01	01	8	0.00	0	PL	+
218	01/22/88	U	0202	02	10	0.00	0	PL	+
219	01/22/88	U	0202	02	3	0.00	0	PL	+
220	01/22/88	U	0202	02	6	0.00	0	PL	+
221	01/22/88	U	01	01	10	0.00	0	PL	+
222	01/22/88	U	0301	03	30	0.00	0	MA	+
223	01/23/88	U	0301	03	10	0.00	0	MA	-
224	01/23/88	S	2103	21	9	0.00	0	CL	-
225	01/23/88	U	0402	04	30	0.00	0	MA	+
226	01/23/88	U	0903	09	60	0.00	0	MA	+
227	01/23/88	U	1002	10	21	0.00	0	MA	-
228	01/24/88	S	2103	21	9	0.00	0	CL	-
229	01/24/88	U	180104	18	30	0.00	0	PL	+
230	01/24/88	U	01	01	36	0.00	0	PL	-
231	01/24/88	U	0	0	20	0.00	0	HE	-
232	01/25/88	U	0407	04	1181	0.00	160	MA	-
233	01/25/88	U	0202	02	10	0.00	0	PL	+
234	01/25/88	U	0406	04	45	0.00	0	UN	-
235	01/25/88	S	2103	21	10	0.00	0	CL	-
236	01/25/88	U	1002	10	40	0.00	0	MA	-
237	01/25/88	U	0401	04	10	0.00	0	BD	-
238	01/25/88	U	0408	04	3	0.00	0	MA	-
239	01/25/88	U	2112	21	47	0.00	0	MA	-
240	01/25/88	U	04	04	2	0.00	0	PL	-

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
241	01/26/88	U	04	04	3	0.00	0	PL	-
242	01/27/88	S	1602	16	146	0.00	0	MA	-
243	01/28/88	S	2103	21	16	0.00	0	CL	-
244	01/28/88	S	0406	04	45	0.00	0	MA	+
245	01/28/88	U	0503	05	3	0.00	0	FO	-
246	01/28/88	S	04	04	10	0.00	0	MA	+
247	01/28/88	U	01	01	19	0.00	0	PL	+
248	01/29/88	S	2103	21	12	0.00	0	CL	-
249	01/29/88	U	100803	10	30	0.00	0	PL	+
250	01/29/88	U	0702	07	30	0.00	0	MA	+
251	01/30/88	S	2103	21	8	0.00	0	CL	-
252	01/31/88	U	0201	02	15	0.00	0	MA	-
253	01/31/88	U	1004	10	5	0.00	0	AD	+
254	01/31/88	U	0204	02	.92	0.00	0	MA	-
255	01/31/88	U	0304	03	30	0.00	0	PL	-
256	01/31/88	S	2103	21	8	0.00	0	CL	-
257	02/01/88	U	2105	21	9	0.00	0	HE	-
258	02/01/88	S	0401	04	119	0.00	385	MA	-
259	02/01/88	U	210203	21	20	0.00	0	HE	+
260	02/01/88	U	0304	03	12	0.00	0	PL	+
261	02/02/88	U	1001	10	8	0.00	0	MA	-
262	02/02/88	U	04	04	3	0.00	0	PL	-
263	02/02/88	U	1008	10	210	0.00	0	MA	-
264	02/02/88	S	2103	21	33	0.00	0	CL	-
265	02/02/88	U	1602	16	20	0.00	0	MA	+
266	02/03/88	U	0402	04	21	0.00	0	MA	+
267	02/03/88	S	2103	21	6	0.00	0	CL	-
268	02/03/88	U	0202	02	6	0.00	0	BD	+
269	02/03/88	U	0304	03	50	0.00	0	PL	-
270	02/03/88	U	040303	04	5	0.00	0	MA	-
271	02/03/88	U	040101	04	247	0.00	0	MA	-
272	02/03/88	S		0	70	0.00	0	MA	-
273	02/03/88	S	1602	16	0	1.00	0	MA	
274	02/03/88	S	1002	10	0	0.50	0	MA	
275	02/03/88	S	1701	17	0	1.00	0	MA	
276	02/04/88	U	0202	02	10	0.00	0	PL	+
277	02/04/88	S	2103	21	6	0.00	0	CL	-
278	02/04/88	U	01	01	3	0.00	0	PL	+
279	02/04/88	U	0202	02	10	0.00	0	PL	+
280	02/04/88	U	04	04	45	0.00	0	PL	-

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE			AUGER STATUS ON=(+) OFF=(-)
281	02/04/88	U	0101	01	0	0.00	0	UN			+
282	02/05/88	U	01	01	5	0.00	0	PL			+
283	02/05/88	U	01	01	5	0.00	0	PL			+
284	02/05/88	U	02	02	9	0.00	0	MA			+
285	02/05/88	U	01	01	9	0.00	0	PL			+
286	02/05/88	U	0202	02	3	0.00	0	PL			+
287	02/05/88	U	01	01	3	0.00	0	HE			+
288	02/05/88	U	01	01	10	0.00	0	PL			+
289	02/05/88	U	01	01	16	0.00	0	PL			+
290	02/05/88	U	04	04	123	0.00	0	PL			-
291	02/05/88	U	04	04	29	0.00	0	PL			-
292	02/05/88	U	04	04	1	0.00	0	PL			-
293	02/05/88	U	020305	02	45	0.00	0	MA			+
294	02/06/88	U	040101	04	111	0.00	0	MA			-
295	02/06/88	U	0306	03	122	0.00	0	UN			-
296	02/06/88	U	2109	21	60	0.00	0	FR	E	W	+
297	02/06/88	U	1008	10	8	0.00	0	UN			+
298	02/06/88	U	2001	20	8	0.00	0	FR	E	W	+
299	02/06/88	S		0	93	0.00	0	MA			-
300	02/06/88	S	08	08	0	1.00	0	MA			
301	02/06/88	S	1002	10	0	0.50	0	MA			
302	02/06/88	S	1602	16	0	1.00	0	MA			
303	02/06/88	U	2001	20	31	0.00	0	FR	E	W	-
304	02/07/88	U	0101	01	9	0.00	0	HE			+
305	02/07/88	U	0202	02	148	0.00	0	BD			-
306	02/07/88	U	020306	02	10	0.00	0	MA			+
307	02/07/88	U	040101	04	39	0.00	0	MA			-
308	02/07/88	U	180104	18	173	0.00	0	FR	E	W	+
309	02/07/88	U	180104	18	6	0.00	0	FR	E	W	+
310	02/07/88	U	180104	18	10	0.00	0	FR	E	W	+
311	02/08/88	U	0202	02	20	0.00	0	BD			-
312	02/08/88	S	2112	21	60	0.00	437	MA			+
313	02/08/88	U	0202	02	4	0.00	0	BD			+
314	02/08/88	S	0204	02	17	0.00	0	MA			+
315	02/08/88	S	2103	21	7	0.00	0	CL			-
316	02/08/88	U	0802	08	37	0.00	0	HE			-
317	02/08/88	U	040101	04	48	0.00	0	MA			-
318	02/09/88	U	0304	03	103	0.00	0	PL			-
319	02/09/88	S		0	4679	30.00	0	MA			-
320	02/09/88	S	160105	16	0	0.50	0	MA			

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
321	02/09/88	S	260304	26	0	1.00	0	MA	
322	02/09/88	S	230204	23	0	1.00	0	MA	
323	02/09/88	S	0903	09	0	1.00	0	MA	
324	02/09/88	S	1603	16	0	6.00	0	MA	
325	02/09/88	S	08	08	0	8.00	1072	MA	
326	02/12/88	U	04	04	1	0.00	0	PL	-
327	02/13/88	U	0304	03	3	0.00	0	PL	+
328	02/13/88	U	040101	04	59	0.00	0	MA	-
329	02/13/88	U	210301	21	10	0.00	0	MA	-
330	02/13/88	U	0304	03	5	0.00	0	PL	-
331	02/13/88	U	2102	21	77	0.00	0	UN	-
332	02/14/88	U	04	04	2	0.00	0	PL	-
333	02/14/88	S	2103	21	29	0.00	0	CL	-
334	02/14/88	U	040101	04	91	0.00	0	MA	-
335	02/14/88	U	04	04	10	0.00	0	PL	-
336	02/14/88	U	0503	05	28	0.00	0	FO	+
337	02/14/88	U	040101	04	45	0.00	0	MA	-
338	02/15/88	U	0101	01	148	0.00	0	MA	-
339	02/15/88	U	0301	03	99	0.00	0	MA	-
340	02/15/88	S	040101	04	36	0.00	0	MA	-
341	02/16/88	U	0504	05	401	0.00	2616	MA	-
342	02/16/88	S	0102	01	35	0.00	0	MA	-
343	02/16/88	S	140302	[illegible]	180	0.00	224	MA	+
344	02/16/88	U	040101	[illegible]	207	0.00	932	MA	+
345	02/16/88	U	0304	03	17	0.00	0	PL	-
346	02/17/88	U	0101	01	16	0.00	0	MA	-
347	02/17/88	U	0101	01	5	0.00	0	BD	-
348	02/17/88	U	04	04	1	0.00	0	PL	+
349	02/17/88	U	01	01	6	0.00	0	PL	+
350	02/17/88	U	1002	10	132	0.00	0	MA	+
351	02/17/88	U	0101	01	16	0.00	0	MA	-
352	02/17/88	U	1602	16	60	0.00	0	PL	+
353	02/18/88	U	0802	09	20	0.00	0	FO	+
354	02/18/88	U		0	44	0.00	0	LP E	-
355	02/18/88	U	0202	02	1	0.00	0	PL	-
356	02/18/88	S	160105	16	26	0.00	0	PL	+
357	02/18/88	U		0	0	0.00	0	UN	+
358	02/18/88	S	2103	21	30	0.00	0	CL	+
359	02/18/88	U	04	04	2	0.00	0	PL	-
360	02/18/88	U	0401	04	7	0.00	0	BD	-

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
361	02/18/88	U	04	04	2	0.00	0	PL	-
362	02/18/88	U	04	04	5	0.00	0	PL	-
363	02/18/88	U	04	04	2	0.00	0	PL	-
364	02/19/88	S	2103	21	15	0.00	0	CL	-
365	02/19/88	U	210301	21	87	0.00	0	CL	-
366	02/19/88	S	1002	10	37	0.00	0	MA	-
367	02/19/88	U	0504	05	272	0.00	2616	MA	-
368	02/19/88	U	0304	03	5	0.00	0	PL	+
369	02/20/88	U	0202	02	20	0.00	0	PL	-
370	02/20/88	U	01	01	7	0.00	0	PL	+
371	02/20/88	S	2103	21	5	0.00	0	CL	-
372	02/20/88	U		0	8	0.00	0	UN	-
373	02/20/88	U	0202	02	6	0.00	0	BD	+
374	02/20/88	U	0202	02	15	0.00	0	BD	-
375	02/20/88	U	0202	02	2	0.00	0	PL	+
376	02/20/88	U	0202	02	2	0.00	0	PL	+
377	02/20/88	U	0202	02	5	0.00	0	PL	+
378	02/21/88	U	0202	02	5	0.00	0	PL	+
379	02/21/88	U	0202	02	3	0.00	0	PL	+
380	02/21/88	U	0304	03	79	0.00	0	PL	-
381	02/21/88	U	01	01	1	0.00	0	HE	+
382	02/21/88	U	0202	02	15	0.00	0	BD	-
383	02/21/88	U	0202	02	1	0.00	0	BD	+
384	02/21/88	S	2103	21	15	0.00	0	CL	-
385	02/21/88	S	1002	10	30	0.00	0	MA	-
386	02/21/88	U	0202	02	4	0.00	0	PL	+
387	02/22/88	S		0	40	0.00	0	MA	-
388	02/22/88	U	0503	05	5	0.00	0	FO	-
389	02/22/88	S		0	55	0.00	0	MA	-
390	02/23/88	S		0	448	0.00	363	MA	-
391	02/23/88	S	0401	04	0	6.00	363	MA	
392	02/23/88	S	1604	16	0	1.00	0	MA	
393	02/23/88	S	0304	03	0	0.50	0	MA	
394	02/23/88	S	160105	16	0	0.50	0	MA	
395	02/23/88	S	2103	21	8	0.00	0	CL	-
396	02/23/88	U	01	01	2	0.00	0	PL	+
397	02/23/88	U	01	01	12	0.00	0	PL	+
398	02/23/88	U		0	17	0.00	0	UN	-
399	02/23/88	S	1002	10	21	0.00	0	MA	-
400	02/24/88	U	01	01	7	0.00	0	PL	+

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
401	02/24/88	U	01	01	3	0.00	0	PL	+
402	02/24/88	U	01	01	18	0.00	0	PL	-
403	02/24/88	U	0202	02	2	0.00	0	PL	+
404	02/24/88	U	0503	05	9	0.00	0	FO	-
405	02/24/88	U	01	01	4	0.00	0	PL	+
406	02/24/88	U	01	01	8	0.00	0	PL	+
407	02/25/88	U	0503	05	7	0.00	0	FO	-
408	02/25/88	S	2103	21	17	0.00	0	CL	-
409	02/25/88	S		0	67	0.00	0	MA	-
410	02/25/88	S	1603	16	288	0.00	313	PL	-
411	02/26/88	U	0102	01	10	0.00	134	UN	-
412	02/26/88	U	210301	21	15	0.00	0	CL	-
413	02/26/88	S	0507	05	24	0.00	0	MA	-
414	02/26/88	S	1002	10	61	0.00	0	UN	-
415	02/27/88	U	01	01	6	0.00	0	PL	+
416	02/27/88	U	01	01	3	0.00	0	PL	+
417	02/27/88	S	2103	21	17	0.00	0	CL	-
418	02/27/88	S	0102	01	45	0.00	134	MA	+
419	02/27/88	S	210205	21	60	0.00	0	MA	-
420	02/27/88	S	1002	10	0	0.50	0	MA	
421	02/27/88	S	1602	16	0	1.00	0	MA	
422	02/27/88	S	0304	03	0	0.50	0	MA	
423	02/28/88	S	1002	10	60	0.00	0	MA	-
424	02/28/88	S	210205	21	0	0.00	0	MA	
425	02/28/88	S	1602	16	0	1.00	0	MA	
426	02/28/88	S	210205	21	0	0.00	0	MA	
427	02/28/88	S	210205	21	0	0.00	0	MA	
428	02/28/88	S	210205	21	0	0.00	0	MA	
429	02/28/88	S	210205	21	0	0.00	0	MA	
430	02/29/88	U	2112	21	8	0.00	0	CL	-
431	02/29/88	U	0202	02	13	0.00	0	PL	-
432	02/29/88	S	1002	10	66	0.00	0	MA	-
433	02/29/88	S	1602	16	0	1.00	0	MA	
434	02/29/88	S	0304	03	0	0.50	0	MA	
435	02/29/88	S	210205	21	0	0.00	0	MA	
436	02/29/88	S	210205	21	0	0.00	0	MA	
437	02/29/88	S	210205	21	0	0.00	0	MA	
438	03/01/88	S	2103	21	12	0.00	0	CL	-
439	03/01/88	U	0202	02	3	0.00	0	PL	+
440	03/01/88	U	01	01	6	0.00	0	PL	+

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
441	03/01/88	U	01	01	12	0.00	0	PL	+
442	03/01/88	U	0503	05	5	0.00	0	FO	-
443	03/02/88	U	2503	25	20	0.00	0	MA	-
444	03/02/88	U	2503	25	25	0.00	0	MA	-
445	03/02/88	U	0802	08	25	0.00	0	FO E W	-
446	03/02/88	U	0202	02	5	0.00	0	PL	+
447	03/02/88	U	0102	01	40	0.00	0	MA	+
448	03/02/88	U	01	01	26	0.00	0	PL	-
449	03/02/88	U	0202	02	11	0.00	0	PL	-
450	03/02/88	S		0	60	0.00	0	MA	-
451	03/02/88	S	1602	16	0	1.00	0	MA	
452	03/02/88	S	0304	03	0	0.50	0	MA	
453	03/02/88	S	210301	21	10	0.00	0	CL	-
454	03/02/88	U	01	01	6	0.00	0	PL	-
455	03/03/88	U	0202	02	1	0.00	0	PL	+
456	03/03/88	U	0406	04	10	0.00	0	MA	+
457	03/03/88	U	01	01	8	0.00	0	PL	+
458	03/03/88	S	2103	21	18	0.00	0	CL	-
459	03/03/88	U	0202	02	6	0.00	0	PL	+
460	03/03/88	U	020306	02	60	0.00	0	MA	+
461	03/03/88	U	2101	21	107	0.00	0	MA	-
462	03/03/88	U	0301	03	46	0.00	0	BD	-
463	03/04/88	S	050302	05	11	0.00	0	MA	+
464	03/04/88	U	0503	05	15	0.00	0	FO	-
465	03/04/88	U	0503	05	6	0.00	0	FO	-
466	03/04/88	S	2103	21	4	0.00	0	CL	-
467	03/04/88	S	0507	05	24	0.00	0	MA	+
468	03/05/88	S	06	06	7599	0.00	0	MA	-
469	03/05/88	S	08	08	0	4.00	1175	MA	
470	03/05/88	S	1603	16	0	2.00	0	MA	
471	03/05/88	S	1601	16	0	1.00	0	MA	
472	03/05/88	S	2302	23	0	1.00	0	MA	
473	03/05/88	S	1402	14	0	1.00	0	MA	
474	03/05/88	S	0502	05	0	8.00	3799	MA	
475	03/05/88	S	1002	10	0	0.50	0	MA	
476	03/05/88	S	1001	10	0	4.00	0	MA	
477	03/05/88	S	0504	05	0	3.00	2616	MA	
478	03/05/88	S	1701	17	0	1.00	0	MA	
479	03/05/88	S	1604	16	0	1.00	0	MA	
480	03/05/88	S	1602	16	0	1.00	0	MA	

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
481	03/05/88	S	100501	10	0	1.00	0	MA	
482	03/05/88	S	1301	13	0	1.00	0	MA	
483	03/05/88	S	01	01	0	2.00	0	MA	
484	03/05/88	S	0508	05	0	2.00	0	MA	
485	03/05/88	S	160104	16	0	0.50	109	MA	
486	03/05/88	S	1802	18	0	0.50	0	MA	
487	03/05/88	S	0501	05	0	4.00	0	MA	
488	03/05/88	S	050606	05	0	4.00	0	MA	
489	03/05/88	S	0501	05	0	24.00	1350	MA	
490	03/05/88	S	050306	05	0	1.00	0	MA	
491	03/05/88	S	080206	08	0	1.00	0	MA	
492	03/05/88	S	010101	01	0	8.00	986	MA	
493	03/05/88	S	220101	22	0	3.00	224	MA	
494	03/05/88	S	0202	02	0	12.00	13872	MA	
495	03/05/88	S	050602	05	0	1.00	0	MA	
496	03/05/88	U	0602	06	1740	0.00	0	UN	-
497	03/09/88	U	050602	05	1095	0.00	0	MA	-
498	03/09/88	U	0602	06	0	0.00	0	BD	+
499	03/10/88	S	2103	21	10	0.00	0	CL	-
500	03/10/88	U	0602	06	0	0.00	0	BD	-
501	03/10/88	U	210205	21	0	0.00	0	MA	+
502	03/10/88	U	01	01	5	0.00	0	HE	+
503	03/10/88	S	0507	05	30	0.00	45	MA	-
504	03/10/88	U	0602	06	150	0.00	0	BD	-
505	03/10/88	U	2105	21	17	0.00	0	HE	-
506	03/11/88	S	2103	21	7	0.00	0	CL	-
507	03/11/88	U	0202	02	4	0.00	0	PL	+
508	03/11/88	S	140402	14	180	0.00	0	MA	+
509	03/12/88	U	210205	21	36	0.00	0	UN	+
510	03/12/88	U	0502	05	4	0.00	0	MA	-
511	03/12/88	S	2103	21	7	0.00	0	CL	-
512	03/12/88	U	0502	05	0	0.00	0	UN	+
513	03/12/88	U	0507	05	2	0.00	45	MA	-
514	03/12/88	U	210205	21	0	0.00	0	AD	+
515	03/12/88	S	0507	05	20	0.00	0	MA	-
516	03/13/88	U	210205	21	0	0.00	0	AD	+
517	03/13/88	U	210205	21	23	0.00	0	UN	-
518	03/13/88	U	0202	02	64	0.00	0	BD	-
519	03/14/88	U	0201	02	15	0.00	0	BD	+
520	03/14/88	U	210205	21	0	0.00	0	UN	-

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
521	03/14/88	S	2103	21	41	0.00	0	CL	-
522	03/14/88	S	1602	16	60	0.00	0	PL	+
523	03/14/88	U	0503	05	9	0.00	0	FO	-
524	03/14/88	U	210205	21	0	0.00	0	AD	+
525	03/14/88	U	210205	21	0	0.00	0	AD	+
526	03/15/88	U	210205	21	0	0.00	0	AD	+
527	03/15/88	U	210205	21	0	0.00	0	AD	+
528	03/15/88	U	210205	21	0	0.00	0	AD	+
529	03/15/88	U	01	01	19	0.00	0	PL	+
530	03/15/88	S	2103	21	25	0.00	0	CL	-
531	03/16/88	U	1405	14	30	0.00	0	MA	+
532	03/16/88	S	2103	21	31	0.00	0	CL	-
533	03/16/88	S	1002	10	0	0.50	0	MA	
534	03/16/88	S	0507	05	0	0.50	45	MA	
535	03/16/88	U	210205	21	0	0.00	0	AD	+
536	03/17/88	U	0502	05	397	0.00	1137	MA	-
537	03/17/88	U	210301	21	0	0.00	0	MA	+
538	03/17/88	U	0602	06	198	0.00	0	BD	-
539	03/18/88	U	0202	02	5	0.00	0	BD	+
540	03/18/88	U	0202	02	3	0.00	0	PL	+
541	03/18/88	U	0507	05	23	0.00	0	MA	-
542	03/18/88	U	0507	05	1	0.00	0	MA	-
543	03/19/88	S	0507	05	43	0.00	45	MA	-
544	03/19/88	S	1602	16	0	0.50	0	MA	
545	03/19/88	S	1002	10	0	0.50	0	MA	
546	03/19/88	S	210205	21	0	0.00	0	MA	
547	03/19/88	S	2103	21	6	0.00	0	CL	-
548	03/19/88	U	060101	06	2	0.00	0	UN	-
549	03/19/88	U	0507	05	18	0.00	45	MA	+
550	03/20/88	U	0507	05	4	0.00	0	MA	+
551	03/20/88	U	0507	05	10	0.00	0	MA	-
552	03/20/88	S	0204	02	60	0.00	0	MA	+
553	03/20/88	S	2103	21	7	0.00	0	CL	-
554	03/20/88	U	0202	02	2	0.00	0	BD	+
555	03/20/88	U	0202	02	5	0.00	0	BD	+
556	03/20/88	U	0202	02	4	0.00	0	BD	+
557	03/20/88	U	0507	05	69	0.00	0	MA	-
558	03/20/88	U	0202	02	5	0.00	0	BD	+
559	03/20/88	U	0507	05	17	0.00	0	MA	-
560	03/21/88	U	020304	02	53	0.00	0	UN	-

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
561	03/21/88	U	020304	02	18	0.00	0	MA	-
562	03/21/88	U	020304	02	5	0.00	0	MA	+
563	03/21/88	U	210205	21	0	0.00	0	AD	+
564	03/21/88	U	020304	02	7	0.00	0	MA	+
565	03/21/88	U	2503	25	10	0.00	0	UN	-
566	03/21/88	U	01	01	22	0.00	0	PL	-
567	03/21/88	S	1002	10	51	0.00	0	MA	-
568	03/21/88	U	1002	10	101	0.00	0	MA	-
569	03/22/88	U	01	01	2	0.00	0	PL	+
570	03/22/88	U	210205	21	0	0.00	0	AD	+
571	03/22/88	U	210205	21	16	0.00	0	MA	-
572	03/22/88	U	0202	02	4	0.00	0	BD	+
573	03/23/88	U	2101	21	10	0.00	0	MA	+
574	03/23/88	U	210205	21	13	0.00	0	AD	+
575	03/23/88	U	210205	21	0	0.00	0	AD	+
576	03/23/88	U	040101	04	83	0.00	0	MA	-
577	03/23/88	S	1602	16	13	0.00	0	PL	+
578	03/23/88	U	0301	03	7	0.00	0	BD	+
579	03/23/88	U	0304	03	7	0.00	0	MA	+
580	03/23/88	U	0507	05	5	0.00	0	MA	-
581	03/23/88	S	2103	21	17	0.00	0	CL	-
582	03/23/88	U	210205	21	55	0.00	0	MA	-
583	03/24/88	U	0301	03	3	0.00	0	BD	+
584	03/24/88	S	2103	21	12	0.00	0	CL	-
585	03/24/88	U	0304	03	15	0.00	0	PL	+
586	03/25/88	U	0202	02	29	0.00	0	PL	-
587	03/25/88	U	0202	02	5	0.00	0	BD	+
588	03/25/88	U	210205	21	0	0.00	0	AD	+
589	03/25/88	U	0602	06	248	0.00	0	UN	-
590	03/25/88	S	2103	21	25	0.00	0	CL	-
591	03/25/88	U	0401	04	1	0.00	0	BD	-
592	03/26/88	U	210205	21	0	0.00	0	AD	+
593	03/26/88	U	0507	05	9	0.00	0	MA	-
594	03/26/88	S	2103	21	8	0.00	0	CL	-
595	03/27/88	U		0	151	0.00	224	MA	-
596	03/27/88	U	180103	18	45	0.00	109	MA	-
597	03/27/88	U	210205	21	0	0.00	0	AD	+
598	03/27/88	U	2001	20	96	0.00	0	MA	-
599	03/28/88	U	0202	02	10	0.00	0	PL	-
600	03/28/88	S	2103	21	6	0.00	0	CL	-

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
601	03/29/88	U	0401	04	112	0.00	0	MA	-
602	03/29/88	U	0401	04	75	0.00	0	MA	-
603	03/29/88	U	04	04	2	0.00	0	PL	-
604	03/29/88	U	2112	21	0	0.00	20	CL	-
605	03/29/88	S	2103	21	5	0.00	0	CL	-
606	03/30/88	U	0304	03	30	0.00	0	PL	+
607	03/30/88	U	0507	05	5	0.00	0	MA	-
608	03/30/88	U	210301	21	6	0.00	0	MA	-
609	03/30/88	S	2103	21	4	0.00	0	CL	-
610	03/31/88	U	180103	18	56	0.00	0	MA	+
611	03/31/88	S	2103	21	31	0.00	0	CL	-
612	03/31/88	S		0	24	0.00	0	MA	-
613	04/01/88	S	2103	21	7	0.00	0	CL	-
614	04/01/88	U	0503	05	4	0.00	0	FO	-
615	04/01/88	U	2503	25	43	0.00	0	UN	+
616	04/02/88	U	0101	01	11	0.00	0	MA	-
617	04/02/88	U	1002	10	30	0.00	0	MA	-
618	04/02/88	U	0802	08	15	0.00	0	FO	-
519	04/02/88	U	050309	05	28	0.00	0	MA	-
620	04/03/88	U	2102	21	0	0.00	0	AD	+
621	04/03/88	U	2102	21	0	0.00	0	AD	+
622	04/03/88	U		0	59	0.00	0	MA	-
623	04/03/88	U	040101	04	12	0.00	0	MA	-
624	04/03/88	S	2101	21	15	0.00	0	AD	-
625	04/03/88	U	2102	21	131	0.00	0	UN	-
626	04/04/88	S	1008	10	180	0.00	0	MA	+
627	04/04/88	S	2103	21	5	0.00	0	CL	-
628	04/04/88	U	210205	21	0	0.00	0	UN	+
629	04/04/88	U	1802	18	15	0.00	0	MA	+
630	04/04/88	U	2102	21	0	0.00	0	AD	+
631	04/04/88	S	1002	10	45	0.00	0	MA	-
632	04/05/88	S	2103	21	8	0.00	0	CL	-
633	04/05/88	U	0401	04	143	0.00	385	MA	-
634	04/05/88	U	0202	02	37	0.00	0	BD	-
635	04/05/88	U	0401	04	63	0.00	0	MA	-
636	04/06/88	S	2103	21	19	0.00	0	CL	-
637	04/06/88	U	0702	07	35	0.00	0	MA	+
638	04/06/88	S		0	60	0.00	0	MA	+
639	04/06/88	U	0504	05	78	0.00	0	MA	-
640	04/07/88	S		0	1920	0.00	0	MA	-

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
641	04/07/88	S	1005	10	0	0.75	0	MA	
642	04/07/88	S	0504	05	0	4.00	2616	MA	
643	04/07/88	S	080201	08	0	1.00	1224	MA	
644	04/07/88	S	06	06	0	0.00	662	MA	
645	04/07/88	S	1001	10	0	4.00	0	MA	
646	04/07/88	S	1002	10	0	0.50	0	MA	
647	04/07/88	S	1801	18	0	1.00	0	MA	
648	04/07/88	S	2110	21	0	0.00	0	MA	
649	04/07/88	S	1701	17	0	1.00	0	MA	
650	04/07/88	S	2103	21	0	0.50	0	MA	
651	04/07/88	S	050309	05	0	0.50	0	MA	
652	04/07/88	S	2112	21	0	0.50	0	MA	
653	04/07/88	S	180201	18	0	0.50	0	MA	
654	04/08/88	U	01	01	2	0.00	0	PL	-
655	04/08/88	U	0202	02	7	0.00	0	BD	-
656	04/08/88	U	2102	21	162	0.00	0	AD	-
657	04/09/88	U	2102	21	0	0.00	0	AD	+
658	04/09/88	S	2103	21	39	0.00	0	CL	-
659	04/09/88	U	010102	01	16	0.00	0	MA	-
660	04/10/88	S	2103	21	8	0.00	0	CL	-
661	04/10/88	U	2102	21	0	0.00	0	AD	+
662	04/10/88	U	2102	21	2	0.00	0	AD	-
663	04/10/88	U	2102	21	0	0.00	0	AD	+
664	04/10/88	U	050608	05	74	0.00	133	MA	-
665	04/10/88	U	010102	01	11	0.00	0	MA	-
666	04/11/88	U	05	05	15	0.00	46	FO	-
667	04/11/88	S	2103	21	5	0.00	0	CL	-
668	04/12/88	U	2101	21	6	0.00	0	MA	-
669	04/12/88	U	2102	21	6	0.00	0	UN	-
670	04/12/88	U	2103	21	10	0.00	0	CL	-
671	04/12/88	U	2102	21	0	0.00	0	AD	+
672	04/12/88	U	0201	02	20	0.00	0	MA	-
673	04/12/88	U	0503	05	3	0.00	0	FO	-
674	04/13/88	U	2102	21	0	0.00	0	AD	+
675	04/13/88	S	2103	21	5	0.00	0	CL	-
676	04/14/88	U	2102	21	10	0.00	0	UN	-
677	04/15/88	U	0202	02	5	0.00	0	BD	+
678	04/15/88	U	0508	05	15	0.00	0	PL	-
679	04/15/88	U	0503	05	29	0.00	0	FO	-
680	04/15/88	U	1602	16	3	0.00	0	MA	+

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
681	04/15/88	U	0202	02	9	0.00	0	PL	-
682	04/15/88	U	2103	21	6	0.00	0	CL	-
683	04/15/88	U	210302	21	27	0.00	0	MA	-
684	04/15/88	U	1002	10	28	0.00	0	MA	-
685	04/15/88	U	1602	16	7	0.00	0	PL	-
686	04/15/88	U	0301	03	9	0.00	0	BD	-
687	04/15/88	S	2103	21	7	0.00	0	CL	-
688	04/15/88	U	2102	21	7	0.00	0	UN	-
689	04/15/88	U	2102	21	0	0.00	0	AD	+
690	04/16/88	U	1001	10	58	0.00	0	MA	-
691	04/16/88	U	0202	02	5	0.00	0	BD	+
692	04/16/88	U	0802	08	110	0.00	0	FO	-
693	04/16/88	S	2103	21	19	0.00	0	CL	-
694	04/17/88	U	1602	16	3	0.00	0	PL	+
695	04/17/88	U	1008	10	30	0.00	0	PL	+
696	04/17/88	U	0504	05	32	0.00	0	MA	-
697	04/17/88	U	0202	02	12	0.00	0	BD	-
698	04/17/88	U	0506	05	0	0.00	0	UN	+
699	04/17/88	U	0102	01	38	0.00	0	MA	+
700	04/17/88	U	0102	01	29	0.00	0	UN	+
701	04/17/88	S	0403	04	1	0.00	0	MA	-
702	04/17/88	S	2103	21	19	0.00	0	CL	-
703	04/18/88	S	2103	21	18	0.00	0	CL	-
704	04/18/88	U	210302	21	2	0.00	0	CL	+
705	04/18/88	S	1002	10	57	0.00	0	MA	-
706	04/19/88	U	1602	16	41	0.00	0	MA	-
707	04/19/88	U	210205	21	0	0.00	0	UN	+
708	04/19/88	U	2102	21	0	0.00	0	AD	-
709	04/19/88	U	1602	16	7	0.00	0	PL	+
710	04/19/88	U	1002	10	3	0.00	0	MA	-
711	04/20/88	S	1002	10	174	0.00	0	MA	-
712	04/20/88	S	2103	21	9	0.00	0	MA	-
713	04/21/88	U	2102	21	0	0.00	0	AD	-
714	04/21/88	U	2103	21	7	0.00	0	MA	-
715	04/21/88	U	2102	21	0	0.00	0	AD	-
716	04/22/88	U	210302	21	19	0.00	0	AD	-
717	04/22/88	U	0504	05	122	0.00	2616	MA	-
718	04/22/88	U	0701	07	25	0.00	0	PL	-
719	04/22/88	U	0202	02	3	0.00	0	BD	+
720	04/22/88	S	2101	21	1	0.00	0	MA	+

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
721	04/23/88	U	2102	21	0	0.00	0	AD	+
722	04/23/88	U	2102	21	0	0.00	0	AD	+
723	04/24/88	U	2102	21	0	0.00	0	AD	-
724	04/24/88	U	2102	21	0	0.00	0	AD	+
725	04/25/88	S	1002	10	22	0.00	0	MA	-
726	04/26/88	U	2105	21	0	0.00	0	AD	+
727	04/26/88	U	050307	05	4	0.00	0	FO	-
728	04/27/88	S	160105	16	30	0.00	0	MA	+
729	04/27/88	U	2105	21	0	0.00	0	UN	+
730	04/29/88	S		0	2880	0.00	0	MA	-
731	04/29/88	S	1602	16	0	4.00	0	MA	
732	04/29/88	S	1503	16	0	2.00	0	MA	
733	04/29/88	S	240303	24	0	4.00	2355	MA	
734	04/29/88	S	1701	17	0	1.00	0	MA	
735	04/29/88	S	1802	18	0	1.00	0	MA	
736	04/29/88	S	1901	19	0	3.00	0	MA	
737	04/29/88	S	1902	19	0	2.00	0	MA	
738	04/29/88	S	040102	04	0	0.00	1937	MA	
739	04/29/88	S	0506	05	0	1.00	133	MA	
740	04/29/88	S	180201	18	0	1.00	268	MA	
741	05/01/88	S	0301	03	4956	10.00	0	MA	-
742	05/01/88	S	0903	09	0	1.00	0	MA	
743	05/01/88	S	16	16	0	4.00	0	MA	
744	05/01/88	S	0501	05	0	24.00	176	MA	
745	05/01/88	S	0201	02	0	4.00	0	MA	
746	05/01/88	S	14	14	0	2.00	0	MA	
747	05/01/88	S	0301	03	0	2.00	0	MA	
748	05/01/88	S	13	13	0	2.00	0	MA	
749	05/01/88	S	27	27	0	3.00	176	MA	
750	05/01/88	S	230203	23	0	2.00	0	MA	
751	05/01/88	S	180201	18	0	3.00	176	MA	
752	05/02/88	S	0507	05	0	2.00	0	MA	
753	05/02/88	S	0201	02	0	0.25	0	MA	
754	05/02/88	S	08	08	0	8.00	1162	MA	
755	05/02/88	S	0801	08	0	1.00	0	MA	
756	05/02/88	S	1601	16	0	0.50	0	MA	
757	05/02/88	S	2601	26	0	0.50	0	MA	
758	05/02/88	S	07	07	0	8.00	0	MA	
759	05/02/88	S	100501	10	0	1.50	0	MA	
760	05/02/88	S	2302	23	0	0.50	0	MA	

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
761	05/02/88	S	0403	04	0	0.25	0	MA	
762	05/02/88	S	10	10	0	6.00	0	MA	
763	05/02/88	S	0101	01	0	9.50	241	MA	
764	05/02/88	S	0203	02	0	0.50	143	MA	
765	05/02/88	S	0705	07	0	16.00	0	MA	
766	05/03/88	S	0502	05	0	18.50	3332	MA	
767	05/03/88	U	1005	10	120	0.00	0	MA	+
768	05/03/88	U	27	27	30	0.00	268	MA	+
769	05/03/88	U	2112	21	30	0.00	0	MA	+
770	05/03/88	U	1005	10	60	0.00	0	MA	+
771	05/04/88	U	2101	21	120	0.00	0	CL	+
772	05/04/88	U	180201	18	30	0.00	0	MA	+
773	05/05/88	U	1405	14	20	0.00	0	MA	+
774	05/05/88	U	050308	05	96	0.00	0	MA	-
775	05/06/88	U	2102	21	0	0.00	0	AD	+
776	05/06/88	U	2102	21	0	0.00	0	AD	+
777	05/07/88	U	[illegible]0104	16	60	0.00	0	MA	+
778	05/07/88	U	1601	16	120	0.00	0	MA	+
779	05/07/88	U	160105	16	30	0.00	0	MA	+
780	05/08/88	U	180201	12	15	0.00	0	MA	+
781	05/08/88	U	2102	21	0	0.00	0	AD	+
782	05/08/88	U		0	38	0.00	0	LP E	-
783	05/08/88	U	2103	21	8	0.00	0	MA	-
784	05/09/88	U	0306	03	53	0.00	0	MA	-
785	05/09/88	U	0406	04	30	0.00	160	MA	+
786	05/09/88	U	0306	03	74	0.00	0	MA	-
787	05/09/88	U	2403	24	120	0.00	0	MA E	+
788	05/09/88	U	2102	21	0	0.00	0	AD	+
789	05/09/88	U	2102	21	0	0.00	0	HE	+
790	05/09/88	U	2102	21	0	0.00	0	AD	+
791	05/10/88	U	2103	21	352	0.00	0	MA	-
792	05/10/88	U	040302	04	30	0.00	176	MA	-
793	05/10/88	U	2112	21	15	0.00	437	MA	-
794	05/10/88	U	0301	03	563	0.00	56	MA	-
795	05/11/88	U	01	01	10	0.00	0	MA	+
796	05/11/88	U	2102	21	0	0.00	0	AD	+
797	05/12/88	U	05	05	4	0.00	0	FO	-
798	05/12/88	U	2102	21	0	0.00	0	AD	+
799	05/12/88	U	2102	21	0	0.00	0	AD	+
800	05/13/88	U	2102	21	0	0.00	0	AD	+

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
801	05/13/88	U	2102	21	0	0.00	0	AD	+
802	05/13/88	U	0202	02	5	0.00	0	PL	+
803	05/13/88	U	2102	21	0	0.00	0	AD	+
804	05/13/88	U	2102	21	0	0.00	0	AD	+
805	05/14/88	U	2101	21	11	0.00	77	MA	-
806	05/14/88	U	0802	08	31	0.00	0	FO	-
807	05/14/88	U	2102	21	25	0.00	0	UN	-
808	05/14/88	U	0202	02	2	0.00	0	BD	+
809	05/14/88	U	2102	21	0	0.00	0	AD	+
810	05/15/88	U	1001	10	135	0.00	0	MA	-
811	05/15/88	U	1002	10	6	0.00	0	MA	-
812	05/15/88	U	160105	16	30	0.00	0	PL	+
813	05/15/88	U	1602	16	30	0.00	0	PL	+
814	05/15/88	U	1602	16	5	0.00	0	PL	+
815	05/15/88	U	1801	18	30	0.00	0	PL	+
816	05/16/88	U	2502	25	15	0.00	0	MA	+
817	05/16/88	U	0102	01	30	0.00	0	MA	+
818	05/16/88	U	2102	21	0	0.00	0	AD	+
819	05/16/88	U	2103	21	3	0.00	0	UN	-
820	05/16/88	U	2102	21	0	0.00	0	UN	+
821	05/16/88	U	2102	21	0	0.00	0	UN	+
822	05/18/88	U	1002	10	16	0.00	0	MA	-
823	05/18/88	U	2112	21	5	0.00	0	CL	+
824	05/18/88	U	160105	16	15	0.00	216	MA	+
825	05/18/88	U	180201	18	10	0.00	0	MA	+
826	05/19/88	U	2102	21	0	0.00	0	UN	+
827	05/20/88	U	2102	21	0	0.00	0	MA	+
828	05/20/88	U	2102	21	0	0.00	0	UN	+
829	05/20/88	U	1002	10	36	0.00	0	MA	-
830	05/21/88	U	0503	05	8	0.00	0	FO	-
831	05/21/88	U	0503	05	8	0.00	0	FO	-
832	05/21/88	U	1002	10	20	0.00	0	MA	-
833	05/21/88	U	0102	01	123	0.00	134	MA	+
834	05/22/88	U	1001	10	387	0.00	0	MA	-
835	05/22/88	U	0101	01	5	0.00	0	AD	-
836	05/22/88	U	0102	01	30	0.00	0	MA	+
837	05/27/88	U	2102	21	0	0.00	0	AD	+
838	05/27/88	U	240303	24	120	0.00	0	MA E S	-
839	05/27/88	U	0201	02	15	0.00	0	PL	-
840	05/28/88	U	0307	03	68	0.00	48	MA	-

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
841	05/28/88	U	0102	01	30	0.00	0	MA	-
842	05/28/88	U	0102	01	15	0.00	0	MA	+
843	05/28/88	U	0307	03	66	0.00	48	MA	-
844	05/28/88	U	2102	21	0	0.00	0	AD	+
845	05/28/88	U	2102	21	0	0.00	0	AD	+
846	05/28/88	U	2112	21	10	0.00	0	MA	+
847	05/29/88	U	0201	02	35	0.00	0	MA	-
848	05/29/88	U	0202	02	14	0.00	0	BD	-
849	05/29/88	U	1002	10	24	0.00	0	MA	-
850	05/29/88	U	2102	21	0	0.00	0	AD	+
851	05/30/88	U	0202	02	8	0.00	0	PL	+
852	05/30/88	U	0201	02	35	0.00	0	MA	-
853	05/31/88	U	2102	21	0	0.00	0	AD	+
854	05/31/88	U	2102	21	0	0.00	0	AD	+
855	05/31/88	U	2102	21	0	0.00	0	AD	+
856	06/01/88	U	0201	02	30	0.00	80	MA	+
857	06/01/88	U	1002	10	32	0.00	0	MA	-
858	06/01/88	U	1001	10	435	0.00	0	MA	-
859	06/01/88	U	0509	05	15	0.00	0	MA	+
860	06/01/88	U	2102	21	0	0.00	0	AD	+
861	06/02/88	U	2103	21	9	0.00	0	MA	+
862	06/02/88	U	2102	21	0	0.00	0	AD	+
863	06/02/88	U	1604	16	11	0.00	0	MA	-
864	06/03/88	U	1603	16	272	0.00	1612	PL	-
865	06/03/88	U	0406	04	10	0.00	0	AD	+
866	06/03/88	U	160105	16	15	0.00	0	UN	+
867	06/03/88	U	1501	15	10	0.00	0	MA	+
868	06/04/88	U	050305	05	3	0.00	90	MA	-
869	06/04/88	U	160105	16	30	0.00	0	MA	+
870	06/05/88	U	0701	07	1	0.00	0	PL	-
871	06/05/88	U	2102	21	0	0.00	0	AD	+
872	06/06/88	U	020305	02	5	0.00	0	MA	+
873	06/07/88	U	2503	25	30	0.00	250	MA	+
874	06/08/88	U	140302	14	90	0.00	0	MA	+
875	06/08/88	U	160104	16	20	0.00	0	MA	+
876	06/08/88	U	2111	21	5	0.00	0	MA	+
877	06/08/88	U	0202	02	15	0.00	0	PL	-
878	06/08/88	U	2102	21	0	0.00	0	AD	+
879	06/09/88	U	060105	06	45	0.00	0	AD	+
880	06/09/88	U	1801	18	90	0.00	620	MA	+

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
881	06/09/88	U	0202	02	69	0.00	0	BD	-
882	06/09/88	U	0509	05	15	0.00	0	MA	+
883	06/09/88	U	010102	01	2	0.00	0	AD	+
884	06/10/88	U	0201	02	64	0.00	0	MA	-
885	06/10/88	U	140302	14	180	0.00	127	MA	+
886	06/11/88	U	0403	04	10	0.00	0	MA	-
887	06/11/88	U	160105	16	60	0.00	0	MA	+
888	06/12/88	U	0509	05	15	0.00	0	MA	+
889	06/12/88	U	2114	21	5	0.00	0	AD	+
890	06/13/88	S	2109	21	15	0.00	0	MA	+
891	06/13/88	S	2109	21	25	0.00	0	MA	+
892	06/13/88	U	0501	05	20	0.00	0	MA	+
893	06/13/88	U	1405	14	128	0.00	0	MA	-
894	06/16/88	U	1402	14	20	0.00	119	MA	+
895	06/16/88	U	2109	21	90	0.00	0	CL	+
896	06/16/88	U	0509	05	30	0.00	0	MA	+
897	06/17/88	U	190201	19	10	0.00	0	MA	+
898	06/18/88	U	040101	04	7	0.00	0	UN	+
899	06/18/88	U	2102	21	0	0.00	0	AD	+
900	06/18/88	U	2102	21	0	0.00	0	AD	+
901	06/18/88	U	2102	21	0	0.00	0	AD	+
902	06/19/88	U	2102	21	0	0.00	0	AD	+
903	06/19/88	U	2102	21	0	0.00	0	AD	+
904	06/19/88	U	0509	05	15	0.00	0	MA	+
905	06/19/88	U	2109	21	15	0.00	0	MA	+
906	06/19/88	U	180104	18	10	0.00	0	MA	+
907	06/20/88	U	1002	10	12	0.00	0	MA	-
908	06/20/88	U	2102	21	0	0.00	0	AD	+
909	06/21/88	U	210302	21	20	0.00	0	MA	-
910	06/21/88	U	210302	21	30	0.00	0	MA	+
911	06/22/88	U	2106	21	5	0.00	0	MA	+
912	06/22/88	U	0505	05	30	0.00	0	MA	+
913	06/22/88	U	1002	10	37	0.00	0	MA	-
914	06/23/88	U	0502	05	373	0.00	0	BD	-
915	06/23/88	U	2109	21	120	0.00	0	LP	+
916	06/23/88	U	02	02	40	0.00	0	AD	+
917	06/23/88	U	0306	03	138	0.00	0	MA	-
918	06/23/88	U	0202	02	28	0.00	0	BD	-
919	06/23/88	U	2102	21	0	0.00	0	AD	+
920	06/23/88	U	2102	21	0	0.00	0	MA	+

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
921	06/23/88	U	2102	21	0	0.00	0	AD	+
922	06/24/88	U	2102	21	0	0.00	0	MA	+
923	06/25/88	U	0509	05	10	0.00	0	MA	+
924	06/25/88	U	1008	10	13	0.00	0	UN	-
925	06/25/88	U	0401	04	2	0.00	0	UN	-
926	06/26/88	U	2103	21	1	0.00	0	CL	-
927	06/26/88	U	2701	27	180	0.00	0	MA	+
928	06/27/88	U	1002	10	12	0.00	0	MA	-
929	06/27/88	U	2114	21	30	0.00	393	HE	-
930	06/27/88	U	2001	20	9	0.00	0	CL	-
931	06/28/88	U	2103	21	225	0.00	0	MA	+
932	06/28/88	U	0401	04	4	0.00	0	UN	-
933	06/28/88	U	0202	02	14	0.00	0	PL	-
934	06/29/88	U	0301	03	10	0.00	0	UN	-
935	06/29/88	U	0403	04	5	0.00	0	MA	-
936	06/29/88	U	1002	10	21	0.00	0	MA	-
937	06/29/88	U	01	01	32	0.00	0	MA	-
938	06/29/88	U	0701	07	20	0.00	0	PL	-
939	06/29/88	U	2109	21	15	0.00	0	MA	+
940	06/29/88	U	2109	21	15	0.00	0	MA	+
941	06/29/88	U	2701	27	120	0.00	0	MA	+
942	06/30/88	U	2102	21	0	0.00	0	AD	+
943	06/30/88	U	0602	06	322	0.00	0	MA	-
944	07/01/88	S		0	9432	0.00	0	MA	-
945	07/01/88	S	16	16	0	1.00	0	MA	
946	07/01/88	S	1001	10	0	4.00	0	MA	
947	07/01/88	S	06	06	0	0.00	0	MA	
948	07/01/88	S	08	08	0	8.00	0	MA	
949	07/01/88	S	0407	04	0	2.00	160	MA	
950	07/01/88	S	0502	05	0	4.00	0	MA	
951	07/01/88	S	0801	08	0	2.00	0	MA	
952	07/01/88	S	0102	01	0	0.00	216	MA	
953	07/01/88	S	060105	06	0	16.00	281	MA	
954	07/01/88	S	0202	02	0	12.00	13872	MA	
955	07/01/88	S	1008	10	0	2.00	3628	MA	
956	07/01/88	S	0509	05	0	0.25	0	MA	
957	07/01/88	S	050308	05	0	3.00	524	MA	
958	07/01/88	S	010101	01	0	8.00	560	MA	
959	07/01/88	S	040302	04	0	1.00	973	MA	
960	07/03/88	U	02	02	1	0.00	0	MA	-

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
961	07/08/88	U	0202	02	5	0.00	0	PL	-
962	07/10/88	U	2112	21	15	0.00	313	MA	+
963	07/11/88	U	0509	05	15	0.00	0	MA	+
964	07/11/88	U	210302	21	20	0.00	0	CL	+
965	07/11/88	U	0201	02	0	0.00	0	MA	-
966	07/12/88	U	020304	02	40	0.00	176	MA	+
967	07/12/88	U	0509	05	20	0.00	189	MA	+
968	07/12/88	U	1002	10	20	0.00	0	MA	-
969	07/13/88	U	2112	21	15	0.00	0	MA	-
970	07/13/88	U	020304	02	65	0.00	143	MA	-
971	07/14/88	U	0301	03	35	0.00	0	BD	-
972	07/15/88	U	0306	03	421	0.00	56	MA E L	-
973	07/15/88	U	2107	21	0	0.00	0	MA	+
974	07/15/88	U	0509	05	10	0.00	0	MA	+
975	07/15/88	U	1606	16	10	0.00	0	MA	+
976	07/15/88	U	2114	21	15	0.00	393	MA	+
977	07/17/88	U	0509	05	90	0.00	0	MA	+
978	07/17/88	U	010101	01	0	0.00	0	MA	+
979	07/18/88	S	2111	21	305	0.00	0	MA	-
980	07/18/88	U	2112	21	30	0.00	750	MA	-
981	07/19/88	U	0202	02	15	0.00	0	PL	+
982	07/21/88	U	2106	21	30	0.00	0	MA	+
983	07/21/88	U	2102	21	10	0.00	0	UN	+
984	07/22/88	U	180105	18	17	0.00	0	MA	-
985	07/22/88	U	0301	03	77	0.00	0	BD	-
986	07/22/88	U	0802	08	31	0.00	0	FO	-
987	07/22/88	U	0301	03	13	0.00	0	MA	-
988	07/23/88	U	2102	21	0	0.00	0	UN	+
989	07/23/88	U	2102	21	0	0.00	0	AD	+
990	07/24/88	U	0301	03	68	0.00	0	MA	-
991	07/24/88	U	2102	21	0	0.00	0	UN	+
992	07/24/88	U	01	01	15	0.00	0	MA	+
993	07/25/88	U	1603	16	300	0.00	0	MA	-
994	07/25/88	U	0509	05	15	0.00	0	MA	+
995	07/26/88	U	160105	16	30	0.00	0	PL	-
996	07/26/88	U	0802	08	7	0.00	0	FO	-
997	07/27/88	U	2302	23	165	0.00	0	MA	+
998	07/27/88	U	260304	26	30	0.00	0	MA	+
999	07/28/88	U	2106	21	5	0.00	0	MA	+
1000	07/29/88	U	1005	10	120	0.00	0	MA	+

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE		AUGER STATUS ON=(+) OFF=(-)
1001	07/29/88	U	2001	20	5	0.00	0	MA		-
1002	07/29/88	U	020304	02	37	0.00	0	MA		-
1003	07/30/88	U	2112	21	5	0.00	0	MA		+
1004	07/30/88	U	2112	21	34	0.00	313	MA		-
1005	07/31/88	U	0301	03	77	0.00	0	MA		-
1006	08/01/88	U	260304	26	60	0.00	0	MA		+
1007	08/01/88	U	2111	21	15	0.00	50	MA		+
1008	08/03/88	U	2302	23	420	0.00	224	MA		+
1009	08/03/88	U	2302	23	60	0.00	0	MA		+
1010	08/04/88	U	230203	23	30	0.00	0	MA		+
1011	08/04/88	U	0509	05	30	0.00	0	MA		+
1012	08/04/88	U	06	06	10	0.00	0	BD		+
1013	08/04/88	U	060105	06	30	0.00	0	AD		+
1014	08/05/88	U	2112	21	60	0.00	0	MA		+
1015	08/06/88	U	020304	02	60	0.00	0	MA		-
1016	08/06/88	U	1002	10	30	0.00	0	MA		-
1017	08/07/88	U		0	34	0.00	0	EP	E	-
1018	08/07/88	U	1001	10	210	0.00	0	MA		-
1019	08/09/88	U	030101	03	15	0.00	0	AD		+
1020	08/10/88	U	0411	04	195	0.00	226	MA		-
1021	08/10/88	U		0	91	0.00	0	LP		-
1022	08/11/88	U	0802	08	21	0.00	0	FO		-
1023	08/11/88	U	0802	08	12	0.00	0	FO		-
1024	08/11/88	U	0411	04	26	0.00	226	MA		-
1025	08/11/88	U	0411	04	82	0.00	226	MA		-
1026	08/12/88	U	260304	26	25	0.00	0	MA		+
1027	08/12/88	U	0802	08	130	0.00	0	FO		-
1028	08/13/88	S		0	11551	0.00	0	MA		-
1029	08/13/88	S	14	14	0	1.00	0	MA		
1030	08/13/88	S	08	08	0	3.50	0	MA		
1031	08/13/88	S	16	16	0	1.00	0	MA		
1032	08/13/88	S	1701	17	0	0.75	0	MA		
1033	08/13/88	S	1001	10	0	8.00	0	MA		
1034	08/13/88	S	1405	14	0	1.50	0	MA		
1035	08/13/88	S	060105	06	0	8.00	0	MA		
1036	08/13/88	S	180103	18	0	4.00	0	MA		
1037	08/13/88	S	100501	10	0	0.00	0	MA		
1038	08/13/88	S	0603	06	0	0.00	0	MA		
1039	08/13/88	S	100501	10	0	0.00	0	MA		
1040	08/13/88	S	100501	10	0	2.00	0	MA		

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
1041	08/13/88	S	1405	14	0	2.00	0	MA	
1042	08/13/88	S	0201	02	0	4.00	0	MA	
1043	08/13/88	S	16	16	0	1.00	0	MA	
1044	03/13/88	S	1005	10	0	0.50	0	MA	
1045	08/13/88	S	140402	14	0	1.00	0	MA	
1046	08/13/88	S	050606	05	0	3.00	0	MA	
1047	08/13/88	S	0401	04	0	6.00	0	MA	
1048	08/13/88	S	0411	04	0	0.00	226	MA	
1049	08/13/88	S	1603	16	0	6.00	0	MA	
1050	08/13/88	S	0802	08	0	2.50	0	MA	
1051	08/13/88	S		0	0	120.00	0	MA	
1052	08/13/88	S	0101	01	0	8.00	0	MA	
1053	08/13/88	S	0202	02	0	12.00	0	MA	
1054	08/21/88	U	2114	21	60	0.00	0	MA	+
1055	08/21/88	U	020303	02	102	0.00	0	MA	-
1056	08/21/88	U	0203	02	10	0.00	0	UN	-
1057	08/21/88	U	0203	02	113	0.00	0	MA	-
1058	08/21/88	U	0203	02	102	0.00	0	MA	-
1059	08/22/88	U	2114	21	60	0.00	0	MA	+
1060	08/23/88	U	2503	25	30	0.00	0	MA	+
1061	08/27/88	U	0202	02	25	0.00	0	PL	-
1062	08/28/88	U	0202	02	60	0.00	0	PL	-
1063	08/28/88	U	0202	02	13	0.00	0	BD	-
1064	08/28/88	U	2503	25	60	0.00	0	MA	+
1065	08/29/88	U	0203	02	1	0.00	0	UN	-
1066	08/29/88	U	0203	02	6	0.00	0	UN	+
1067	08/29/88	U	0203	02	0	0.00	0	UN	+
1068	08/29/88	U	1002	10	59	0.00	0	MA	-
1069	08/29/88	U	020303	02	19	0.00	0	LP	-
1070	08/29/88	U	020302	02	4147	0.00	0	MA	-
1071	09/01/88	U	100501	10	150	0.00	0	MA	+
1072	09/01/88	U	0203	02	1520	0.00	60000	MA	-
1073	09/02/88	U		0	25	0.00	0	LP	-
1074	09/02/88	U	0802	08	8	0.00	0	FO	-
1075	09/02/88	U	0802	08	25	0.00	0	FO	-
1076	09/03/88	U	0802	08	34	0.00	0	FO	-
1077	09/03/88	U	0301	03	0	0.00	0	UN	+
1078	09/04/88	U	0301	03	30	0.00	0	MA	-
1079	09/05/88	U		0	33	0.00	0	LP	-
1080	09/06/88	U		0	32	0.00	0	LP	-

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
1081	09/07/88	U	260304	26	15	0.00	0	MA	+
1082	09/08/88	U	1002	10	30	0.00	0	MA	-
1083	09/08/88	U	080201	08	60	0.00	1224	MA	-
1084	09/08/88	U	0301	03	246	0.00	0	MA	-
1085	09/08/88	S		0	507	0.00	0	BT	-
1086	09/09/88	U		0	3780	0.00	0	ST E W	-
1087	09/09/88	S			196	0.00	0	BT	-
1088	09/10/88	U	0903	09	10	0.00	0	MA	-
1089	09/10/88	U	060201	06	195	0.00	121	MA	-
1090	09/11/88	U	050401	05	310	0.00	361	MA	-
1091	09/12/88	S			1440	0.00	0	BT	-
1092	09/13/88	S			1440	0.00	0	BT	-
1093	09/14/88	S			1080	0.00	0	BT	-
1094	09/14/88	U	050310	05	10	0.00	250	MA	-
1095	09/14/88	U	2114	21	110	0.00	0	MA	+
1096	09/14/88	U	010101	01	63	0.00	0	AD	-
1097	09/15/88	U	0301	03	150	0.00	0	MA	-
1098	09/15/88	U	0509	05	30	0.00	0	MA	-
1099	09/16/88	U	010101	01	15	0.00	0	BD	+
1100	09/17/88	U	1002	10	10	0.00	0	MA	-
1101	09/18/88	U	0202	02	11	0.00	0	PL	-
1102	09/18/88	U	0202	02	15	0.00	0	PL	-
1103	09/18/88	U	0202	02	5	0.00	0	PL	-
1104	09/18/88	U	0202	02	9	0.00	0	PL	-
1105	09/19/88	U	0509	05	15	0.00	0	PL	+
1106	09/19/88	U	0701	07	120	0.00	0	PL	-
1107	09/19/88	S	2114	21	123	0.00	0	CL	+
1108	09/20/88	U	1002	10	39	0.00	0	MA	-
1109	09/20/88	U	1002	10	16	0.00	0	MA	-
1110	09/21/88	U	0306	03	30	0.00	0	MA	+
1111	09/21/88	U	1002	10	50	0.00	0	MA	-
1112	09/21/88	U	0202	02	366	0.00	0	PL	-
1113	09/22/88	U	0301	03	277	0.00	0	MA	-
1114	09/22/88	U	0307	03	59	0.00	48	MA	-
1115	09/23/88	U	1001	10	358	0.00	0	MA	-
1116	09/23/88	U	180201	18	15	0.00	0	MA	-
1117	09/23/88	U	0301	03	9	0.00	0	MA	-
1118	09/24/88	U	0508	05	592	0.00	0	PL	-
1119	09/24/88	U	1301	13	10	0.00	392	MA	-
1120	09/24/88	U	0304	03	420	0.00	0	MA	-

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE		AUGER STATUS ON=(+) OFF=(-)
1121	09/25/88	U	0502	05	1170	0.00	0	MA		-
1122	09/25/88	U	1603	16	270	0.00	0	MA		-
1123	09/26/88	U	0502	05	480	0.00	0	MA		-
1124	09/26/88	U	0705	07	420	0.00	0	MA		-
1125	09/26/88	U	08	08	540	0.00	1300	MA		-
1126	09/27/88	S	2114	21	40	0.00	120	CL		+
1127	09/27/88	S	2114	21	55	0.00	0	CL		+
1128	09/27/88	S	2114	21	15	0.00	0	CL		+
1129	09/27/88	U	0602	06	630	0.00	0	BD		-
1130	09/27/88	U	02	02	50	0.00	0	MA		-
1131	09/27/88	U	0802	08	22	0.00	0	FO		-
1132	09/28/88	U	230203	23	60	0.00	148	MA		+
1133	09/28/88	U	0802	08	9	0.00	0	FO		-
1134	09/29/88	U	0802	08	16	0.00	0	FO		-
1135	09/30/88	U	010101	01	120	0.00	0	UN		-
1136	09/30/88	U	060201	06	740	0.00	241	MA		-
1137	09/30/88	U	02	02	30	0.00	0	MA		-
1138	10/02/88	U	2502	25	15	0.00	0	MA		+
1139	10/03/88	U	0301	03	282	0.00	0	MA		-
1140	10/03/88	U	240302	24	240	0.00	40	MA	E	+
1141	10/04/88	U	0509	05	30	0.00	0	MA		+
1142	10/04/88	U	01	01	148	0.00	0	MA		-
1143	10/04/88	U	10[illegible]	10	30	0.00	0	MA		-
1144	10/04/88	U	2108	21	120	0.00	0	MA		+
1145	10/04/88	S	2114	21	30	0.00	393	CL		+
1146	10/05/88	U	210201	21	30	0.00	0	MA		-
1147	10/06/88	U	040302	04	464	0.00	786	MA		-
1148	10/06/88	U	0404	04	90	0.00	410	MA		-
1149	10/07/88	U	040302	04	23	0.00	0	MA		-
1150	10/07/88	U	040302	04	20	0.00	0	MA		-
1151	10/07/88	U	210301	21	10	0.00	85	MA		-
1152	10/07/88	U	040302	04	25	0.00	0	MA		-
1153	10/09/88	U	0307	03	34	0.00	48	MA		-
1154	10/10/88	U	1002	10	12	0.00	0	MA		-
1155	10/10/88	U	0307	03	870	0.00	48	MA		-
1156	10/10/88	U	1001	10	390	0.00	0	MA		-
1157	10/13/88	S	2114	21	60	0.00	0	CL		+
1158	10/14/88	U	2114	21	45	0.00	120	MA		+
1159	10/15/88	U	1701	17	24	0.00	0	PL		-
1160	10/15/88	U	0508	05	11	0.00	0	MA		-

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
1161	10/15/88	U	2114	21	35	0.00	0	CL	+
1162	10/17/88	S	2114	21	120	0.00	85	CL	+
1163	10/17/88	U	220103	22	45	0.00	601	MA	+
1164	10/18/88	U	0406	04	1	0.00	0	MA	-
1165	10/18/88	U	2106	21	25	0.00	0	MA	+
1166	10/18/88	U	2111	21	14	0.00	0	MA	-
1167	10/18/88	U	2114	21	75	0.00	66	MA	+
1168	10/19/88	U	1002	10	67	0.00	0	MA	-
1169	10/19/88	U	2110	21	30	0.00	0	MA	-
1170	10/21/88	U		0	0	0.00	0	MA	+
1171	10/24/88	U	0602	06	100	0.00	0	AD	-
1172	10/24/88	U	1002	10	30	0.00	0	MA	-
1173	10/24/88	U	2112	21	25	0.00	258	MA	-
1174	10/25/88	S	2114	21	95	0.00	120	CL	+
1175	10/26/88	U	0202	02	53	0.00	0	BD	-
1176	10/27/88	U	2109	21	15	0.00	0	MA	+
1177	10/27/88	U	0508	05	15	0.00	0	PL	-
1178	10/27/88	U	0903	09	20	0.00	0	MA	-
1179	10/30/88	U	2106	21	30	0.00	0	AD	+
1180	10/30/88	U	210301	21	15	0.00	0	MA	+
1181	10/31/88	U	01	01	6	0.00	0	PL	-
1182	10/31/88	U	0202	02	21	0.00	0	PL	-
1183	10/31/88	U	2112	21	19	0.00	0	AD	-
1184	10/31/88	U	2112	21	10	0.00	258	MA	-
1185	10/31/88	U	01	01	220	0.00	0	BD	-
1186	11/01/88	S		0	5040	0.00	0	MA	-
1187	11/01/88	S	1001	10	360	0.00	0	MA	
1188	11/01/88	S	1601	16	180	0.00	0	MA	
1189	11/01/88	S	07	07	120	0.00	0	MA	
1190	11/01/88	S	0301	03	240	0.00	0	MA	
1191	11/01/88	S	08	08	180	0.00	1028	MA	
1192	11/01/88	S	09	09	180	0.00	0	MA	
1193	11/01/88	S	1701	17	60	0.00	30	MA	
1194	11/01/88	S	1802	18	60	0.00	0	MA	
1195	11/01/88	S	2115	21	600	0.00	771	MA	
1196	11/01/88	S	1901	19	120	0.00	8496	MA	
1197	11/04/88	U	1104	11	15	0.00	0	MA	-
1198	11/04/88	S			3090	0.00	0	BT	-
1199	11/07/88	U	2103	21	11	0.00	0	MA	-
1200	11/07/88	U	02	02	2	0.00	0	AD	-

INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE - Cont'd

RECORD NUMBER	DATE	TYPE	SUB-COMP. CODE	MAJOR COMP. CODE	TIME DOWN (min)	LABOR (hr)	PARTS ($)	FAIL MODE	AUGER STATUS ON=(+) OFF=(-)
1201	11/08/88	U	1002	10	7	0.00	0	MA	-
1202	11/10/88	S	2114	21	70	0.00	0	CL	+
1203	11/10/88	U	210301	21	45	0.00	0	MA	-
1204	11/10/88	U	1002	10	30	0.00	0	MA	-
1205	11/10/88	U		0	0	0.00	0	UN	-
1206	11/11/88	U	0301	03	6	0.00	0	BD	-
1207	11/11/88	U	0201	02	3	0.00	0	BD	-
1208	11/11/88	U	0802	08	10	0.00	0	MA	+
1209	11/12/88	S			1440	0.00	0	BT	-
1210	11/13/88	S			1380	0.00	0	BT	-
1211	11/13/88	U	0602	06	60	0.00	0	MA	+
1212	11/14/88	S			720	0.00	0	BT	-
1213	11/14/88	U	1001	10	690	0.00	0	MA	-
1214	11/14/88	U	02	02	180	0.00	0	MA	-
1215	11/15/88	U	160105	16	20	0.00	0	PL	+
1216	11/16/88	S	2114	21	90	0.00	0	CL	+
1217	11/16/88	U	0602	06	600	0.00	0	MA	-
1218	11/17/88	U	0604	06	30	0.00	0	MA	-
1219	11/17/88	U	1701	17	15	0.00	0	PL	-
1220	11/17/88	U	180105	18	35	0.00	0	PL	+
1221	11/17/88	U	0202	02	6	0.00	0	BD	-
1222	11/17/88	U	2116	21	25	0.00	0	MA	+
1223	11/19/88	U	230203	23	20	0.00	640	MA	+

NOTES RELATING TO
INCINERATOR (MWP-2000) SCHEDULED AND UNSCHEDULED MAINTENANCE DATABASE

A. Definition of database fields:

1. RECORD NUMBER
2. DATE (Year, Month, Day)
3. TYPE - S=Scheduled, U=Unscheduled
4. SUB- COMP. CODE - Code assigned to incinerator component
5. MAJOR COMP. CODE - Code assigned to incinerator major components (First two characters of SUB- COMP. CODE)
6. TIME DOWN (min) - Time required to correct problem
7. LABOR (hr) - Labor hours required to correct problem
8. PARTS ($) - Cost of replacement parts
9. FAIL MODE - Code assigned for cause of component failure
10. AUGER STATUS - Code assigned to operating status of auger (Auger OFF=(-) and Auger ON=(+)

B. Definition of failure cause (FAIL MODE) codes:

1. AD - out of adjustment
2. BD - failure caused by binding
3. BT - burned trash (not actually a failure. This code was used to differentiate between burning of trash and contaminated soils)
4. CL - out of calibration
5. E - cause of failure is from an external source
6. FO - loss of flame in the kiln or secondary combustion unit
7. FR - plugged lines caused by freezing
8. HE - failure due to human error
9. L - loss of room lighting (used in conjunction with E)
10. LP - loss of electrical power to component or system
11. MA - maintenance related activity
12. PL - failure caused by plugging
13. S - loss of water supply to component or system (used in conjunction with E)
14. ST - failure due to a storm (e.g., hurricane)
15. UN - cause of failure unknown
16. W - failure attributed to adverse weather conditions (used in conjunction with E)

APPENDIX D

INTERLOCK DATA BASE

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INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
1	11/25/87	LRT	3	24
2	11/26/87	LRT	31	3
3	11/26/87	LKOT	3	3
4	11/26/87	CE	27	2
5	11/26/87	HCO	21	2
6	11/27/87	LKOD	4	4
7	11/27/87	LKOT	72	25
8	11/27/87	LSOT	45	41
9	11/27/87	LRT	3	3
10	11/27/87	CE	12	2
11	11/27/87	HCO	25	2
12	11/28/87	LRT	21	1
13	11/29/87	LKOT	4	13
14	11/29/87	HCO	21	1
15	11/29/87	CE	19	1
16	11/30/87	LKOT	1	3
17	12/01/87	LKOT	12	9
18	12/01/87	HARPM	8	3
19	12/01/87	HAFR	15	2
20	12/01/87	LRT	54	6
21	12/02/87	LRT	12	85
22	12/02/87	LKOT	13	12
23	12/02/87	HAFR	8	67
24	12/03/87	KOTB	3	2
25	12/03/87	LRT	17	24
26	12/03/87	HAFR	9	61
27	12/03/87	LO2	10	1
28	12/03/87	CE	4	2
29	12/04/87	HARPM	1	5
30	12/04/87	LO2	36	1
31	12/04/87	HCO	6	2
32	12/04/87	LRT	34	96
33	12/04/87	LKOT	4	8
34	12/05/87	LKOT	127	13
35	12/05/87	LRT	26	35
36	12/05/87	HCO	19	5
37	12/05/87	CE	9	5
38	12/05/87	HAFR	2	15
39	12/05/87	LSOT	2	7
40	12/07/87	HARPM	1	10
41	12/07/87	LSOT	5	10
42	12/07/87	LKOT	3	4
43	12/12/87	HARPM	378	60
44	12/12/87	LSOT	3	3
45	12/12/87	LPTR	3	2

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
46	12/12/87	LKOT	131	36
47	12/12/87	KOTB	1	8
48	12/12/87	HCO	53	3
49	12/12/87	LRT	6	5
50	12/12/87	CE	17	2
51	1[illegible]/12/87	LKOD	5	8
52	12/13/87	HAFR	6	18
53	12/13/87	CE	14	6
54	12/13/87	HCO	25	6
55	12/13/87	HARPM	5611	03
56	12/13/87	LPTR	2	8
57	12/13/87	LSOT	21	21
58	12/13/87	LRT	18	23
59	12/13/87	KOTB	6	21
60	12/13/87	LKOD	1	4
61	12/13/87	LKOT	55	53
62	12/15/87	CE	55	6
63	12/15/87	LRT	16	133
64	12/15/87	LKOT	9	12
65	12/15/87	HCO	82	6
66	12/15/87	HAFR	2	14
67	12/16/87	HAFR	1	7
68	12/16/87	LO2	1	1
69	12/16/87	CE	37	8
70	12/16/87	LSOT	13	5
71	12/16/87	LKOT	46	35
72	12/16/87	LRT	712	23
73	12/16/87	HCO	102	15
74	12/17/87	LKOT	109	86
75	12/17/87	HAFR	2	18
76	12/17/87	LSOT	14	5
77	12/17/87	LRT	1	15
78	12/17/87	CE	8	1
79	12/17/87	HCO	70	14
80	12/18/87	HCO	10	1
81	12/18/87	LKOT	23	25
82	12/18/87	HAFR	3	20
83	12/18/87	CE	1	1
84	12/18/87	LRT	7	9
85	12/19/87	LKOT	83	47
86	12/19/87	CE	4	2
87	12/19/87	HAFR	2	12
88	12/19/87	HCO	21	3
89	12/20/87	HCO	49	11
90	12/20/87	LKOT	129	106

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
91	12/20/87	LKOD	39	42
92	12/27/87	LKOT	568	53
93	12/27/87	HCO	70	10
94	12/27/87	CE	21	16
95	12/27/87	LO2	5	2
96	12/27/87	COA	7	3
97	12/27/87	LSOT	868	8
98	12/28/87	LKOT	27	15
99	12/28/87	HAFR	2	11
100	12/28/87	CE	18	2
101	12/28/87	HCO	15	2
102	12/28/87	LRT	17	106
103	12/28/87	LSOT	20	1
104	12/29/87	HAFR	16	121
105	12/29/87	HCO	66	8
106	12/29/87	CE	56	5
107	12/29/87	LKOT	48	29
108	12/29/87	LRT	7	47
109	12/29/87	LSOT	2	4
110	12/30/87	HAFR	11	74
111	12/30/87	HCO	10	1
112	12/30/87	SRL	4	6
113	12/30/87	LKOT	48	77
114	12/30/87	LRT	15	57
115	12/31/87	LKOT	8	14
116	12/31/87	HAFR	1	9
117	12/31/87	HCO	2	1
118	01/01/88	HCO	5	1
119	01/01/88	HAFR	9	6
120	01/01/88	LKOT	71	209
121	01/02/88	LRT	5	44
1[illegible]	01/02/88	LKOT	23	62
123	01/02/88	HCO	33	7
124	01/03/88	HCO	43	6
125	01/03/88	LKOT	11	27
126	01/03/88	LSOT	6	9
127	01/04/88	LKOT	13	9
128	01/04/88	LRT	2	20
129	01/04/88	HCO	12	2
130	01/05/88	LRT	17	31
131	01/05/88	CE	19	6
132	01/05/88	HCO	60	6
133	01/05/88	LKOT	65	76
134	01/05/88	LKOD	1	2
135	01/06/88	LRT	10	6

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
136	01/06/88	HCO	29	5
137	01/06/88	LKOT	7	13
138	01/13/88	CE	19	4
139	01/13/88	LRT	21	21
140	01/13/88	LKOT	18	12
141	01/13/88	HAFR	8	52
142	01/13/88	HCO	38	4
143	01/14/88	LKOT	5	11
144	01/14/88	HAFR	40	15
145	01/14/88	LRT	12	27
146	01/14/88	HCO	3	1
147	01/15/88	HAFR	7	67
148	01/15/88	LRT	5	4
149	01/16/88	LKOT	16	11
150	01/17/88	HCO	7	2
151	01/17/88	LKOT	49	40
152	01/18/88	LKOT	21	29
153	01/18/88	LO2	8	2
154	01/18/88	LRT	14	5
155	01/18/88	HCO	21	10
156	01/19/88	HCO	8	4
157	01/19/88	HAFR	12	52
158	01/19/88	LO2	6	7
159	01/19/88	LKOT	15	38
160	01/20/88	LPTR	1	1
161	01/20/88	LKOT	48	33
162	01/20/88	CE	7	3
163	01/20/88	LRT	26	7
164	01/21/88	LSOT	2	3
165	01/21/88	LKOT	20	35
166	01/21/88	HCO	23	4
167	01/22/88	HAFR	15	21
168	01/23/88	LKOT	3	5
169	01/23/88	HCO	14	5
170	01/23/88	HAFR	2	15
171	01/24/88	SRL	2	6
172	01/25/88	HAFR	15	19
173	01/25/88	LKOT	11	14
174	01/25/88	HCO	40	11
175	01/27/88	HAFR	28	157
176	01/28/88	LKOT	2	5
177	01/28/88	HAFR	21	136
178	01/30/88	KOTB	5	21
179	02/01/88	LSOT	2	2
180	02/01/88	LKOD	3	2

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
181	02/01/88	LO2	1	1
182	02/01/88	HCO	16	2
183	02/01/88	LKOT	1	2
184	02/02/88	HCO	14	3
185	02/02/88	LO2	13	4
186	02/02/88	HAFR	22	180
187	02/03/88	SRL	5	28
188	02/03/88	LSOT	5	3
189	02/03/88	HCO	4	1
190	02/03/88	LKOT	1	2
191	02/04/88	LRT	4	25
192	02/04/88	HAFR	4	30
193	02/05/88	HAFR	26	160
194	02/05/88	LKOT	3	1
195	02/06/88	HAFR	22	163
196	02/06/88	HCO	30	5
197	02/06/88	LSOT	1	2
198	02/06/88	LRT	9	49
199	02/06/88	LKOT	22	15
200	02/06/88	LKOD	2	1
201	02/07/88	LRT	110	54
202	02/07/88	HCO	11	2
203	02/07/88	SRL	21	3
204	02/07/88	LO2	1	6
205	02/07/88	HAFR	17	138
206	02/07/88	LKOT	16	12
207	02/08/88	LKOT	31	25
208	02/08/88	HAFR	4	22
209	02/08/88	LRT	5	5
210	02/08/88	HCO	20	5
211	02/08/88	LSOT	13	4
212	02/08/88	LO2	5	4
213	02/08/88	LKOD	1	7
214	02/09/88	LKOD	5	2
215	02/12/88	LKOT	30	14
216	02/12/88	HAFR	10	67
217	02/13/88	LRT	5	16
218	02/13/88	LKOT	39	4
219	02/14/88	HAFR	3	27
220	02/15/88	LRT	3	1
221	02/15/88	HAFR	31	271
222	02/16/88	HAFR	2	14
223	02/17/88	HAFR	40	50
224	02/17/88	LKOT	25	30
225	02/18/88	LKOT	9	4

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
226	02/18/88	CE	2	1
227	02/18/88	LPTR	1	3
228	02/18/88	HAFR	5	33
229	02/18/88	HCO	13	4
230	02/19/88	LO2	27	20
231	02/19/88	HCO	30	10
232	02/19/88	LSOT	10	17
233	02/19/88	HAFR	3	1
234	02/19/88	LKOD	9	9
235	02/19/88	LKOT	275	22
236	02/19/88	LRT	38	11
237	02/19/88	CE	42	11
238	02/20/88	LO2	22	21
239	02/20/88	CE	11	3
240	02/20/88	LSOT	1	4
241	02/20/88	HCO	16	3
242	02/20/88	HAFR	8	1
243	02/20/88	LKOT	34	24
244	02/20/88	LPTR	2	2
245	02/21/88	LKOT	14	12
246	02/21/88	HCO	19	4
247	02/21/88	CE	14	4
248	02/21/88	LO2	12	18
249	02/21/88	LKOD	5	5
250	02/22/88	CE	43	10
251	02/22/88	LRT	1	4
252	02/22/88	HAFR	16	3
253	02/22/88	LKOD	3	46
254	02/22/88	HCO	55	10
255	02/22/88	LKOT	9	6
256	02/22/88	LPTR	10	10
257	02/23/88	CE	2	1
258	02/23/88	LO2	4	9
259	02/23/88	HAFR	35	3
260	02/23/88	LSOT	2	1
261	02/23/88	LRT	2	2
262	02/23/88	LKOT	12	3
263	02/23/88	HCO	4	2
264	02/24/88	LKOT	90	37
265	02/24/88	LRT	3	7
266	02/24/88	SRL	4	15
267	02/24/88	HCO	5	1
268	02/24/88	LO2	7	18
269	02/24/88	HAFR	45	7
270	02/24/88	CE	3	1

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
271	02/24/88	LPTR	1	2
272	02/25/88	LKOD	36	19
273	02/25/88	LKOT	45	35
274	02/25/88	HAFR	33	5
275	02/25/88	HCO	6	2
276	02/25/88	CE	38	7
277	02/25/88	LO2	14	11
278	02/26/88	LRT	3	3
279	02/26/88	LKOD	13	38
280	02/26/88	HAFR	98	9
281	02/26/88	LO2	4	13
282	02/26/88	LKOT	80	37
283	02/26/88	LSOT	2	6
284	02/27/88	HAFR	72	12
285	02/27/88	LKOT	59	25
286	02/27/88	LKOD	7	60
287	02/27/88	LO2	26	27
288	02/28/88	HAFR	78	9
289	02/28/88	LO2	22	6
290	02/28/88	LKOD	6	54
291	02/28/88	LKOT	8	2
292	02/29/88	LKOT	5	11
293	02/29/88	LO2	17	9
294	02/29/88	HAFR	33	7
295	02/29/88	LKOD	1	2
296	03/01/88	LSOT	2	7
297	03/01/88	LO2	16	6
298	03/01/88	KOTB	2	3
299	03/01/88	LKOT	43	22
300	03/01/88	HAFR	41	6
301	03/02/88	LO2	19	18
302	03/02/88	LRT	5	2
303	03/02/88	HCO	4	1
304	03/02/88	LKOT	12	9
305	03/02/88	LKOD	1	5
306	03/02/88	LPTR	[illegible]	2
307	03/02/88	LSOT	15	15
308	03/03/88	LKOT	6	9
309	03/03/88	LKOD	4	4
310	03/03/88	LSOT	29	7
311	03/03/88	LPTR	24	11
312	03/03/88	CE	7	1
313	03/03/88	LRT	3	4
314	03/03/88	STSO	2	2
315	03/03/88	HCO	21	8

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
316	03/04/88	LKOD	23	26
317	03/04/88	LSOT	10	9
318	03/04/88	HCO	33	5
319	03/04/88	LO2	23	5
320	03/04/88	CE	17	10
321	03/04/88	LKOT	6	17
322	03/04/88	LRT	13	5
323	03/04/88	HAFR	20	3
324	03/05/88	HAFR	9	2
325	03/05/88	LKOT	43	20
326	03/05/88	LKOD	24	15
327	03/05/88	LRT	19	18
328	03/10/88	LKOD	2	1
329	03/10/88	HAFR	6	1
330	03/10/88	HCO	12	2
331	03/10/88	CE	3	2
332	03/11/88	HCO	40	10
333	03/11/88	LKOD	9	23
334	03/11/88	HAFR	47	7
335	03/11/88	LRT	11	7
336	03/11/88	LO2	6	4
337	03/11/88	LKOT	20	21
338	03/11/88	CE	3	3
339	03/12/88	LKOD	31	19
340	03/12/88	HAFR	118	14
341	03/12/88	LRT	23	14
342	03/12/88	HCO	35	9
343	03/12/88	CE	4	1
344	03/12/88	LKOT	7	9
345	03/13/88	LKOD	3	8
346	03/13/88	HAFR	176	13
347	03/13/88	CE	3	1
348	03/13/88	LKOT	9	5
349	03/13/88	HCO	16	5
350	03/13/88	LRT	55	8
351	03/14/88	HCO	8	1
352	03/14/88	HAFR	58	40
353	03/14/88	LRT	18	8
354	03/14/88	LKOT	2	2
355	03/14/88	CE	4	2
356	03/15/88	LO2	8	3
357	03/15/88	CE	2	6
358	03/15/88	COA	5	3
359	03/15/88	HAFR	44	11
360	03/15/88	LKOD	4	3

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
361	03/15/88	HCO	9	4
362	03/15/88	LRT	19	14
363	03/15/88	LKOT	3	1
364	03/16/88	HCO	3	1
365	03/16/88	LKOD	18	13
366	03/16/88	HAFR	10	1
367	03/18/88	LKOT	6	6
368	03/18/88	LKOD	30	31
369	03/18/88	HAFR	33	35
370	03/18/88	HCO	3	1
371	03/18/88	LO2	4	2
372	03/19/88	LO2	9	7
373	03/19/88	COA	1	4
374	03/19/88	HAFR	33	21
375	03/19/88	HCO	3	1
376	03/19/88	LKOD	17	76
377	03/19/88	LSOT	1	3
378	03/19/88	LKOT	13	6
379	03/20/88	LO2	15	7
380	03/20/88	HCO	7	1
381	03/20/88	LKOT	9	11
382	03/20/88	HAFR	24	37
383	03/20/88	LKOD	47	109
384	03/21/88	LRT	10	1
385	03/21/88	HAFR	27	3
386	03/21/88	LKOD	16	38
387	03/21/88	HCO	9	1
388	03/21/88	LO2	7	3
389	03/22/88	HAFR	73	8
390	03/22/88	LRT	6	1
391	03/22/88	LKOT	11	20
392	03/22/88	LO2	3	4
393	03/22/88	LKOD	7	15
394	03/22/88	LSOT	6	19
395	03/23/88	SRL	2	13
396	03/23/88	LRT	3	1
397	03/23/88	HAFR	85	9
398	03/23/88	LSOT	13	3
399	03/23/88	HCO	10	2
400	03/23/88	LO2	1	2
401	03/23/88	LKOT	2	2
402	03/23/88	LKOD	7	21
403	03/24/88	LKOT	3	4
404	03/24/83	LKOD	2	11
405	03/24/88	HCO	4	1

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
406	03/24/88	HAFR	30	22
407	03/24/88	LO2	11	3
408	03/25/88	HCO	6	1
409	03/25/88	CE	6	1
410	03/25/88	LKOD	14	8
411	03/25/88	HAFR	36	5
412	03/25/88	LSOT	6	2
413	03/26/88	HAFR	22	13
414	03/26/88	LO2	16	15
415	03/26/88	LRT	4	1
416	03/26/88	LKOT	2	10
417	03/26/88	LKOD	4	20
418	03/27/88	LKOT	2	11
419	03/27/88	LKOD	35	28
420	03/27/88	LSOT	18	2
421	03/27/88	LO2	6	8
422	03/27/88	LRT	12	1
423	03/27/88	SRL	1	9
424	03/27/88	HAFR	104	18
425	03/28/88	LKOD	3	21
426	03/28/88	HAFR	45	12
427	03/28/88	LO2	6	13
428	03/28/88	LSOT	5	3
429	03/29/88	LKOT	5	14
430	03/29/88	LKOT	5	14
431	03/29/88	HAFR	19	2
432	03/29/88	LPTR	20	3
433	03/29/88	LO2	3	10
434	03/29/88	LKOD	15	39
435	0/33/880	LKOT	4	8
436	03/30/88	LO2	8	5
437	03/30/88	LKOD	6	21
438	03/30/88	HAFR	33	10
439	03/31/88	HAFR	21	3
440	03/31/88	LKOD	15	39
441	03/31/88	COA	4	5
442	03/31/88	LKOT	40	26
443	03/31/88	HCO	12	5
444	03/31/88	LO2	25	18
445	03/31/88	LSOT	8	7
446	03/31/88	CE	12	12
447	04/01/88	HAFR	114	36
448	04/01/88	LKOT	33	37
449	04/01/88	LKOD	8	46
450	04/01/88	LO2	22	15

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
451	04/02/88	LRT	1	1
452	04/02/88	HAFR	7	7
453	04/02/88	CE	2	1
454	04/02/88	LO2	11	9
455	04/02/88	LKOT	6	11
456	04/02/88	LKOD	16	22
457	04/02/88	HCO	3	1
458	04/03/88	HAFR	20	8
459	04/03/88	LO2	11	3
460	04/03/88	LKOT	9	24
461	04/04/88	HAFR	17	3
462	04/04/88	LKOT	23	13
463	04/04/88	LKOD	1	10
464	04/05/88	LRT	2	1
465	04/05/88	HCO	2	1
466	04/05/88	LO2	23	6
467	04/05/88	LKOD	1	8
468	04/05/88	LKOT	7	13
469	04/05/88	CE	2	2
470	04/05/88	HAFR	33	9
471	04/06/88	LKOD	2	13
472	04/06/88	HAFR	65	14
473	04/06/88	LKOT	10	18
474	04/08/88	CE	2	1
475	04/08/88	LKOT	4	1
476	04/08/88	LRT	2	1
477	04/08/88	HAFR	67	39
478	04/08/88	HCO	2	1
479	04/09/88	HCO	1	1
480	04/09/88	HAFR	60	15
481	04/10/88	HAFR	85	11
482	04/11/88	LKOT	23	13
483	04/11/88	HAFR	48	7
484	04/11/88	LKOD	3	3
485	04/12/88	LKOT	8	21
486	04/12/88	HAFR	69	26
487	04/13/88	HCO	4	4
488	04/13/88	LKOT	1	4
489	04/13/88	CE	1	1
490	04/13/88	HAFR	73	29
491	04/14/88	CE	3	1
492	04/14/88	HCO	52	15
493	04/14/88	LSOT	3	1
494	04/14/88	LKOT	3	2
495	04/14/88	LKOD	2	2

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
496	04/14/88	HAFR	120	64
497	04/14/88	LRT	1	1
498	04/15/88	HCO	9	5
499	04/15/88	CE	5	2
500	04/15/88	LKOT	33	27
501	04/15/88	HAFR	19	16
502	04/15/88	LKOD	6	10
503	04/16/88	LSOT	22	1
504	04/16/88	HCO	11	2
505	04/16/88	HAFR	46	7
506	04/16/88	LKOT	7	9
507	04/17/88	LKOT	16	14
508	04/17/88	LRT	1	1
509	04/17/88	CE	2	2
510	04/17/88	HCO	7	3
511	04/17/88	LKOD	3	12
512	04/18/88	LKOT	50	30
513	04/18/88	HCO	18	11
514	04/18/88	HAFR	89	35
515	04/18/88	CE	16	7
516	04/18/88	KOTB	3	10
517	04/18/88	LRT	7	1
518	04/18/88	LKOD	8	7
519	04/19/88	LO2	2	1
520	04/19/88	HCO	24	14
521	04/19/88	HAFR	179	59
522	04/19/88	CE	16	11
523	04/19/88	LKOD	7	35
524	04/19/88	LRT	21	2
525	04/19/88	LKOT	34	27
526	04/20/88	CE	3	2
527	04/20/88	LKOT	63	50
528	04/20/88	HAFR	63	34
529	04/20/88	HCO	5	2
530	04/20/88	LKOD	1	2
531	04/21/88	HCO	20	8
532	04/21/88	KOTB	27	2
533	04/21/88	LKOT	72	40
534	04/21/88	LKOD	1	3
535	04/21/88	HAFR	55	26
536	04/21/88	LRT	3	1
537	04/21/88	CE	7	6
538	04/22/88	COA	3	11
539	04/22/88	HCO	9	7
540	04/22/88	CE	4	3

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
541	04/22/88	KTSO	1	1
542	04/22/88	HAFR	132	44
543	04/23/88	HCO	8	5
544	04/23/88	HAFR	91	18
545	04/23/88	CE	3	3
546	04/24/88	LKOT	5	10
547	04/24/88	CE	3	4
548	04/24/88	HCO	14	8
549	04/24/88	HAFR	104	15
550	04/25/88	HAFR	100	12
551	04/25/88	LKOT	9	13
552	04/25/88	HCO	9	6
553	04/26/88	LKOD	1	3
554	04/26/88	HCO	14	6
555	04/26/88	LKOT	14	5
556	04/26/88	HAFR	121	14
557	04/26/88	CE	8	5
558	04/26/88	LO2	1	1
559	04/27/88	HAFR	37	12
560	04/27/88	LPTR	5	8
561	04/27/88	LKOT	6	5
562	04/28/88	LKOT	22	6
563	04/28/88	HCO	6	1
564	04/28/88	CE	3	2
565	04/28/88	LKOD	4	13
566	04/28/88	HAFR	108	32
567	04/29/88	HAFR	128	67
568	04/29/88	LKOD	19	2
569	04/29/88	LKOT	52	16
570	04/29/88	CE	32	17
571	04/29/88	HCO	47	13
572	04/29/88	LSOT	1	6
573	04/30/88	LSOT	7	11
574	04/30/88	HCO	10	31
575	04/30/88	CE	8	25
576	04/30/88	LKOT	27	28
577	05/04/88	SRL	13	17
578	05/04/88	HAFR	2	1
579	05/06/88	HAFR	39	25
580	05/06/88	LKOT	19	19
581	05/06/88	HCO	3	1
582	05/07/88	LKOD	1	4
583	05/07/88	HAFR	112	18
584	05/07/88	LKOT	14	15
585	05/07/88	LPTR	14	14

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
586	05/08/88	LKOD	2	7
587	05/08/88	HCO	3	1
588	05/08/88	CE	1	2
589	05/08/88	LSOT	2	1
590	05/08/88	HAFR	62	8
591	05/08/88	LRT	5	1
592	05/09/88	LKOD	1	5
593	05/09/88	LRT	1	1
594	05/09/88	LO2	9	1
595	05/09/88	HAFR	14	13
596	05/10/88	LKOT	1	6
597	05/10/88	LKOD	1	3
598	05/10/88	HAFR	17	2
599	05/11/88	LRT	3	1
600	05/11/88	LKOT	4	3
601	05/11/88	LKOD	1	8
602	05/11/88	HAFR	65	14
603	05/12/88	HAFR	41	5
604	05/12/88	LRT	2	2
605	05/12/88	LKOT	6	2
606	05/12/88	LKOD	3	8
607	05/13/88	KOTB	1	6
608	05/13/88	HCO	2	1
609	05/13/88	LKOT	2	3
610	05/13/88	LO2	2	1
611	05/13/88	CE	2	2
612	05/13/88	LKOD	3	6
613	05/13/88	HAFR	97	17
614	05/14/88	LKOT	1	2
615	05/14/88	HAFR	36	4
616	05/14/88	LKOD	3	18
617	05/15/88	HCO	14	6
618	05/14/88	HCO	2	1
619	05/15/88	CE	12	9
620	05/15/88	LKOT	5	7
621	05/15/88	LKOD	24	75
622	05/15/88	HAFR	42	5
623	05/16/88	LRT	1	1
624	05/16/88	LKOD	2	6
625	05/16/88	CE	7	4
626	05/16/88	HCO	21	10
627	05/16/88	LSOT	2	6
628	05/16/88	LKOT	6	12
629	05/16/88	HAFR	34	6
630	05/17/88	LO2	1	2

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
631	05/17/88	HCO	7	3
632	05/17/88	LSOT	5	11
633	05/17/88	HAFR	59	17
634	05/17/88	LKOD	10	54
635	05/17/88	LKOT	6	21
636	05/18/88	LPTR	2	2
637	05/18/88	LKOD	15	84
638	05/18/88	LKOT	21	12
639	05/18/88	HCO	19	5
640	05/18/88	HAFR	69	31
641	05/18/88	KOTB	2	1
642	05/19/88	HCO	2	1
643	05/19/88	HAFR	127	57
644	05/19/88	CE	1	1
645	05/19/88	LKOT	23	29
646	05/19/88	LKOD	11	61
647	05/19/88	LO2	4	4
648	05/20/88	HAFR	95	78
649	05/20/88	LKOD	32	135
650	05/20/88	LSOT	2	8
651	05/20/88	HCO	37	16
652	05/20/88	LKOT	7	12
653	05/20/88	LPTR	2	1
654	05/21/88	LKOD	8	47
655	05/21/88	HAFR	32	11
656	05/21/88	LKOT	22	18
657	05/21/88	HCO	12	7
658	05/21/88	LSOT	2	8
659	05/22/88	HAFR	3	1
660	05/22/88	LKOT	1	1
661	05/22/88	LKOD	1	3
662	05/23/88	HAFR	53	9
663	05/23/88	HCO	2	1
664	05/23/88	COA	1	8
665	05/24/88	LKOT	5	8
666	05/24/88	HAFR	118	25
667	05/24/88	LKOD	1	8
668	05/25/88	LKOT	2	6
669	05/25/88	HAFR	55	15
670	05/25/88	LKOD	1	9
671	05/26/88	LKOT	1	2
672	05/26/88	HAFR	3	1
673	05/27/88	HAFR	51	10
674	05/28/88	LSOT	3	7
675	05/28/88	LKOD	1	7

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
676	05/28/88	LKOT	20	10
677	05/28/88	HAFR	35	8
678	05/29/88	LKOT	6	2
679	05/29/88	HAFR	31	4
680	05/30/88	HAFR	16	7
681	05/30/88	LKOT	3	5
682	05/31/88	LKOD	3	14
683	05/31/88	LKOT	2	3
684	05/31/88	HAFR	68	19
685	06/01/88	LKOD	7	38
686	06/01/88	HCO	12	6
687	06/01/88	LKOT	13	15
688	06/01/88	HAFR	76	21
689	06/02/88	LKOD	12	63
690	06/02/88	HAFR	16	5
691	06/02/88	HCO	16	7
692	06/02/88	LSOT	1	7
693	06/02/88	LKOT	16	18
694	06/03/88	LKOD	7	35
695	06/03/88	LKOT	4	9
696	06/03/88	CE	2	1
697	06/03/88	HCO	12	5
698	06/03/88	HAFR	28	19
699	06/04/88	LKOD	1	9
700	06/05/88	HAFR	6	1
701	06/05/88	LRT	1	1
702	06/06/88	LRT	2	2
703	06/06/88	COA	1	1
704	06/06/88	HCO	1	1
705	06/06/88	LKOD	1	4
706	06/08/88	LKOD	2	12
707	06/08/88	HCO	2	2
708	06/08/88	HAFR	4	1
709	06/09/88	HAFR	48	5
710	06/09/88	SRL	4	10
711	06/09/88	LKOD	1	7
712	06/10/88	LKOD	3	15
713	06/10/88	HAFR	29	8
714	06/11/88	HAFR	34	14
715	06/11/88	LKOD	3	18
716	06/11/88	LO2	2	2
717	06/12/88	HAFR	10	2
718	06/12/88	LO2	3	1
719	06/12/88	LKOD	1	7
720	06/13/88	HAFR	36	5

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
721	06/13/88	LSOT	1	3
722	06/14/88	LKOD	1	8
723	06/14/88	HAFR	11	2
724	06/15/88	LKOD	1	5
725	06/15/88	HAFR	6	2
726	06/15/88	LO2	1	1
727	06/16/88	HAFR	31	8
728	06/17/88	HAFR	9	2
729	06/17/88	LKOT	1	2
730	06/18/88	HAFR	81	28
731	06/18/88	LKOD	9	20
732	06/19/88	HAFR	13	5
733	06/20/88	HAFR	44	5
734	06/20/88	HCO	1	1
735	06/20/88	LPTR	1	7
736	06/21/88	HAFR	34	5
737	06/21/88	LKOD	1	5
738	06/21/88	HCO	3	2
739	06/21/88	COA	1	7
740	06/22/88	HAFR	28	5
741	06/22/88	LKOT	1	3
742	06/23/88	HAFR	2	1
743	06/23/88	LKOT	1	1
744	06/24/88	HAFR	32	9
745	06/24/88	LKOD	2	9
746	06/25/88	LKOD	1	12
747	06/25/88	HAFR	4	1
748	06/25/88	LKOT	2	3
749	06/25/88	HCO	3	1
750	06/26/88	LKOD	2	11
751	06/26/88	CE	1	1
752	06/26/88	HAFR	10	4
753	06/27/88	HCO	1	2
754	06/27/88	LKOT	4	21
755	06/27/88	LSOT	1	3
756	06/27/88	LKOD	2	13
757	06/28/88	LKOD	3	26
758	06/28/88	HAFR	42	5
759	06/28/88	CE	1	2
760	06/28/88	LKOT	7	8
761	06/28/88	HCO	8	8
762	06/29/88	LKOD	9	54
763	06/29/88	HAFR	69	13
764	06/29/88	HCO	5	2
765	06/29/88	LSOT	1	7

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
766	06/29/88	LKOT	2	10
767	06/30/88	HAFR	25	4
768	06/30/88	LKOD	3	18
769	06/30/88	LSOT	2	12
770	06/27/88	HAFR	24	3
771	06/27/88	COA	9	18
772	07/07/88	HAFR	1	1
773	07/07/88	LKOT	13	7
774	07/07/88	HCO	1	1
775	07/08/88	HAFR	27	8
776	07/08/88	HCO	8	7
777	07/08/88	LKOT	15	21
778	07/09/88	LKOT	7	7
779	07/09/88	HCO	3	2
780	07/09/88	HAFR	15	4
781	07/10/88	HAFR	41	4
782	07/10/88	LKOT	4	1
783	07/11/88	HAFR	5	1
784	07/11/88	LKOT	15	22
785	07/11/88	LSOT	47	8
786	07/11/88	HCO	39	12
787	07/11/88	CE	10	2
788	07/11/88	LPTR	2	1
789	07/11/88	COA	11	30
790	07/12/88	HCO	14	9
791	07/12/88	LSOT	11	7
792	07/12/88	LKOT	67	17
793	07/13/88	HCO	1	2
794	07/13/88	HAFR	8	3
795	07/13/88	KUTB	2	2
796	07/13/88	LKOT	64	22
797	07/14/88	LKOT	4	2
798	07/14/88	HAFR	1	2
799	07/14/88	HCO	2	2
800	07/15/88	LKOT	1	8
801	07/15/88	HAFR	23	4
802	07/16/88	HAFR	18	3
803	07/16/88	LKOT	9	13
804	07/17/88	HAFR	19	2
805	07/17/88	LKOT	15	12
806	07/17/88	LPTR	3	3
807	07/17/88	LSOT	17	5
808	07/17/88	HCO	3	4
809	07/18/88	LKOT	1	3
810	07/18/88	LKOD	1	6

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
811	07/18/88	HAFR	13	2
812	07/18/88	HCO	3	2
813	07/19/88	HAFR	74	10
814	07/19/88	HCO	1	3
815	07/20/88	HAFR	4	1
816	07/20/88	LKOT	6	3
817	07/20/88	HCO	1	1
818	07/20/88	SRL	3	6
819	07/21/88	LKOT	12	8
820	07/21/88	LKOD	1	2
821	07/21/88	HAFR	28	5
822	07/21/88	LSOT	1	8
823	07/21/88	HCO	5	6
824	07/22/88	HAFR	28	24
825	07/22/88	LKOT	13	13
826	07/22/88	LKOD	7	16
827	07/23/88	HAFR	41	9
828	07/23/88	LRT	1	2
829	07/23/88	HCO	1	1
830	07/23/88	LKOD	1	13
831	07/24/88	HCO	2	2
832	07/24/88	LSOT	1	5
833	07/24/88	HAFR	40	15
834	07/24/88	LKOD	7	52
835	07/24/88	LKOT	11	19
836	07/25/88	HCO	2	3
837	07/25/88	LKOT	2	9
838	07/25/88	HAFR	34	4
839	07/26/88	HAFR	53	5
840	07/26/88	LKOD	8	7
841	07/26/88	LPTR	4	2
842	07/26/88	LSOT	7	5
843	07/27/88	LSOT	14	5
844	07/27/88	HAFR	50	4
845	07/27/88	LKOD	4	29
846	07/27/88	HCO	4	1
847	07/28/88	HAFR	56	6
848	07/28/88	HCO	1	1
849	07/28/88	LKOD	1	5
850	07/29/88	LKOD	2	18
851	07/29/88	HAFR	12	5
852	07/29/88	LKOT	7	10
853	07/29/88	HCO	4	3
854	07/30/88	LKOT	8	16
855	07/30/88	HAFR	78	17

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
856	07/30/88	HCO	3	1
857	07/30/88	LSOT	1	2
858	07/31/88	LKOT	3	17
859	07/31/88	HCO	6	3
860	08/01/88	LKOD	1	13
861	08/01/88	LKOT	11	5
862	08/01/88	HAFR	6	1
863	08/02/88	LKOT	7	8
864	08/02/88	HAFR	44	7
865	08/03/88	LKOT	2	9
866	08/03/88	HAFR	40	6
867	08/03/88	HCO	2	1
868	08/04/88	HAFR	40	6
869	08/04/88	LKOT	8	3
870	08/04/88	LRT	1	1
871	08/05/88	LKOD	1	5
872	08/05/88	HAFR	58	11
873	08/05/88	LKOT	1	1
874	08/05/88	LSOT	10	3
875	08/06/88	HAFR	42	16
876	08/06/88	LKOD	1	10
877	08/06/88	LRT	1	1
878	08/06/88	CE	1	1
879	08/07/88	LKOD	3	11
880	08/07/88	LSOT	20	3
881	08/07/88	SRL	2	1
882	08/07/88	LO2	2	1
883	08/09/88	LRT	1	1
884	08/09/88	LKOT	1	2
885	08/10/88	HAFR	29	3
886	08/10/88	LKOT	5	12
887	08/10/88	HCO	1	1
888	08/10/88	LO2	13	7
889	08/10/88	LSOT	31	2
890	08/11/88	LKOD	1	11
891	08/11/88	HAFR	15	4
892	08/11/88	LSOT	28	4
893	08/11/88	LKOT	16	15
894	08/12/88	LKOT	10	8
895	08/12/88	HAFR	46	4
896	08/12/88	LSOT	15	1
897	08/13/88	HAFR	3	1
898	08/21/88	HAFR	55	7
899	08/21/88	HCO	12	4
900	08/21/88	LRT	1	2

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
901	08/21/88	LKOT	9	7
902	08/21/88	LSOT	1	7
903	08/22/88	HAFR	43	7
904	08/22/38	HCO	19	9
905	08/22/88	LSOT	4	17
906	08/22/88	LKOT	91	25
907	08/23/88	HCO	11	5
908	08/23/88	HAFR	68	17
909	08/23/88	LKOT	8	9
910	08/23/88	LSOT	1	9
911	08/23/88	LRT	1	1
912	08/24/88	HAFR	43	20
913	08/24/88	LSOT	2	15
914	08/24/88	HCO	23	11
915	08/25/88	HCO	12	6
916	08/25/88	HAFR	39	8
917	08/25/88	LRT	4	7
918	08/25/88	CE	4	3
919	08/25/88	LKOT	4	5
920	08/26/88	HAFR	26	5
921	08/26/88	LKOT	11	20
922	08/26/88	LKOD	1	7
923	08/26/88	HCO	2	1
924	08/27/88	HCO	9	3
925	08/27/88	LKOT	10	4
926	08/27/88	HAFR	11	14
927	08/27/88	LKOD	1	10
928	08/28/88	LKOT	23	16
929	08/28/88	LKOD	3	15
930	08/28/88	HAFR	40	9
931	08/28/88	CE	2	6
932	08/28/88	HCO	14	5
933	08/29/88	HAFR	2	6
934	09/02/88	HCO	9	2
935	09/02/88	LSOT	38	7
936	09/02/88	LKOD	10	11
937	09/02/88	HAFR	61	37
938	09/03/88	HAFR	27	24
939	09/03/88	HCO	9	3
940	09/03/88	LKOD	1	6
941	09/03/88	LSOT	36	2
942	09/04/88	HAFR	24	4
943	09/05/88	HAFR	42	12
944	09/05/88	LKOT	18	24
945	09/05/88	LSOT	17	1

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
946	09/06/88	LSOT	29	5
947	09/06/88	LKOT	4	8
948	09/06/88	HAFR	39	23
949	09/06/88	LRT	2	1
950	09/14/88	HAFR	38	8
951	09/15/88	HAFR	81	16
952	09/15/88	LKOT	3	6
953	09/16/88	LKOT	44	24
954	09/16/88	HAFR	35	6
955	09/17/88	LKOD	12	29
956	09/17/88	HAFR	60	14
957	09/17/88	LKOT	25	26
958	09/17/88	HCO	4	1
959	09/18/88	LKOT	15	4
960	09/18/88	LO2	2	4
961	09/18/88	HAFR	57	6
962	09/19/88	HAFR	73	15
963	09/19/88	LKOT	27	16
964	09/19/88	LKOD	1	9
965	09/19/88	LO2	4	8
966	09/20/88	HAFR	121	57
967	09/20/88	LKOT	36	12
968	09/20/88	LO2	2	5
969	09/21/88	HAFR	28	17
970	09/21/88	LKOT	33	9
971	09/21/88	HCO	7	5
972	09/22/88	LKOT	35	14
973	09/22/88	HAFR	54	9
974	09/22/88	HCO	5	1
975	09/22/88	LKOD	1	8
976	09/23/88	HCO	7	2
977	09/23/88	LSOT	1	5
978	09/23/88	LRT	1	1
979	09/23/88	HAFR	78	9
980	09/23/88	LKOT	8	2
981	09/24/88	LKOD	1	7
982	09/24/88	LKOT	6	3
983	09/27/88	LSOT	25	3
984	09/28/88	LSOT	18	12
985	09/28/88	CE	3	1
986	09/28/88	HAFR	68	16
987	09/28/88	HCO	4	1
988	09/29/88	HAFR	142	27
989	09/30/88	LSOT	11	6
990	09/30/88	HAFR	64	5

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
991	10/01/88	HAFR	118	9
992	10/02/88	LSOT	5	1
993	10/02/88	HAFR	38	5
994	10/03/88	HAFR	82	11
995	10/04/88	HAFR	21	4
996	10/05/88	HAFR	131	5
997	10/06/88	HAFR	4	1
998	10/07/88	HAFR	108	11
999	10/07/88	LKOD	2	7
1000	10/08/88	HAFR	142	51
1001	10/08/88	LKOD	1	4
1002	10/08/88	LSOT	6	3
1003	10/08/88	HCO	1	1
1004	10/09/88	HAFR	80	21
1005	10/10/88	HAFR	69	47
1006	10/10/88	LKOD	5	22
1007	10/10/88	LKOT	5	1
1008	10/10/88	HCO	1	1
1009	10/11/88	HAFR	65	10
1010	10/11/88	LRT	1	2
1011	10/12/88	HAFR	34	6
1012	10/12/88	SRL	1	2
1013	10/13/88	HAFR	17	4
1014	10/13/88	LRT	1	3
1015	10/14/88	HAFR	34	25
1016	10/14/88	SRL	1	1
1017	10/15/88	SRL	23	12
1018	10/15/88	HAFR	43	17
1019	10/16/88	HAFR	56	11
1020	10/16/88	SRL	5	24
1021	10/17/88	HAFR	65	11
1022	10/17/88	SRL	1	4
1023	10/17/88	CE	1	1
1024	10/18/88	SRL	6	16
1025	10/18/88	HAFR	41	9
1026	10/19/88	HAFR	55	9
1027	10/20/88	HAFR	97	39
1028	10/21/88	HAFR	31	12
1029	10/22/88	HAFR	64	27
1030	10/23/88	HAFR	56	9
1031	10/24/88	STBO	16	5
1032	10/24/88	HAFR	80	44
1033	10/24/88	LKOD	4	4
1034	10/25/88	HAFR	64	12
1035	10/26/88	HAFR	74	72

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
1036	10/27/88	HAFR	60	24
1037	10/27/88	LKOD	11	12
1038	10/27/88	LSOT	2	4
1039	10/27/88	LO2	6	4
1040	10/27/88	LPTR	5	3
1041	10/28/88	HAFR	78	12
1042	10/28/88	LKOD	1	2
1043	10/28/88	LPTR	2	6
1044	10/29/88	HAFR	26	10
1045	10/30/88	HAFR	4	1
1046	10/31/88	HAFR	53	10
1047	10/31/88	STBO	22	5
1048	10/31/88	LO2	3	1
1049	11/06/88	LRT	11	18
1050	11/06/88	HAFR	2	1
1051	11/06/88	LKOD	4	10
1052	11/07/88	HAFR	52	7
1053	11/07/88	LKOD	4	34
1054	11/07/88	LRT	11	18
1055	11/07/88	HCO	4	2
1056	11/07/88	LO2	1	11
1057	11/08/88	LKOD	7	7
1058	11/08/88	HAFR	36	7
1059	11/08/88	HCO	10	3
1060	11/09/88	HAFR	28	4
1061	11/09/88	LRT	28	22
1062	11/09/88	LO2	1	3
1063	11/10/88	LKOD	2	16
1064	11/10/88	HAFR	53	12
1065	11/10/88	LRT	13	4
1066	11/11/88	HAFR	50	14
1067	11/11/88	LKOT	1	12
1068	11/11/88	HCO	3	1
1069	11/11/88	LKOD	1	10
1070	11/12/88	LKOT	1	3
1071	11/12/88	HCO	12	3
1072	11/15/88	LPTR	2	4
1073	11/15/88	HAFR	7	1
1074	11/16/88	HAFR	30	8
1075	11/16/88	SRL	2	12
1076	11/17/88	HAFR	78	18
1077	11/18/88	HAFR	22	2
1078	11/18/88	LO2	1	3
1079	11/19/88	HAFR	26	2
1080	11/19/88	LO2	8	2

INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE - Cont'd

RECORD	DATE	INTERLOCK CODE	DAILY DOWN TIME (min)	NUMBER OF INTERLOCKS PER DAY
1081	11/19/88	LRT	1	1

CODE IDENTIFICATION USED WITH THE
INCINERATOR (MWP-2000) INSTRUMENTATION INTERLOCK DATABASE

CODE	DESCRIPTION
CE	Combustion Efficiency
COA	Carbon Monoxide (CO) Analyzer Out
HAFR	High Average Feed Rate
HARPM	High Auger RPM
HCO	High Carbon Monoxide (CO)
KOTB	Kiln Outlet Temperature Burnout
KTSO	Kiln Temperature Sensor Out
LKOD	Low Kiln Outlet Draft
LKOT	Low Kiln Outlet Temperature
LO2	Low Oxygen
LPTR	Low Packed Tower Recirculation
LRT	Low Retention Time
LSOT	Low Secondary Outlet Temperature
SRL	Scrubber Recirculation Low
STBO	Secondary Temperature Burnout
STSO	Secondary Temperature Sensor Out

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